The Journal

— OF THE —

AMERICAN CHEMICAL SOCIETY.

VOLUME VI.

1884.

INDEX OF AUTHORS.

INDEX OF TITLES.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Annual Meeting, Jan. 4, 1884.

Vice-President A. R. LEEDS in the chair.

The report of the librarian was read.

The report of the curators was also read.

The committee on publications stated that the last number of the Journal for 1883 was in the hands of the printer.

The committee on nominations then reported, and the election of officers for the ensuing year was then entered upon, and the following gentlemen elected.

*President—*JAMES C. BOOTH.

Vice-Presidents.

A. R. LEEDS.	J. H. APPLETON.
C. A. DOREMUS.	F. G. WORMLEY.
E. WALLER.	A. B. PRESCOTT.

*Corresponding Secretary—*P. CASAMAJOR.

*Recording Secretary—*C. E. MUNSELL.

*Treasurer—*T. O'C. SLOANE.

*Librarian—*WILLIAM RUPP.

Curators.

F. C. WIECHMANN.	LOUIS S. WARE.
E. F. CRUSE.	

Committee on Papers and Publications.

JAS. H. STEBBINS, Jr.	A. A. BRENEMAN.

Committee on Nominations.

ARTHUR H. ELLIOTT.	J. P. BATTERSHALL,
O. H. KRAUSE.	J. B. F. HERRESHOFF.
A. P. HALLOCK.	

Board of Directors.

A. R. LEEDS.
C. A. DOREMUS.
E. WALLER.

P. CASAMAJOR.	C. F. CHANDLER.
C. E. MUNSELL.	H. MORTON.
T. O'C. SLOANE.	JAS. H. STEBBINS, JR.
WM. RUPP.	WM. M. HABIRSHAW.
M. ALSBERG.	H. ENDEMANN.

The meeting then adjourned.

T. S. GLADDING,
Recording Secretary.

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ANNUAL REPORT OF THE TREASURER OF THE AMERICAN CHEMICAL SOCIETY FOR THE YEAR 1883.

DR.				CR.			
1883.				**1883.**			
Jan. 1. To Cash on hand....	$133 10			Jan. By Bills paid..........	$113 57		
Jan. To Month's collections..	450 02			Feb. " " "	3 75		
Feb. " " " ..	153 00			Mar. " " "	157 70		
Mar. " " " ..	60 00			April. " " "	30 37		
April. " " " ..	10 00			May. " " "	53 02		
May. " " " ..	30 00			June. " " "	197 82		
June. " " " ..	5 00			Oct. " " "	201 07		
July. " " " ..	10 00			Nov. " " "	75 41		
Aug. " " " ..	10 00						
Sept. " " " ..	5 00						
Oct. " " " ..	70 00						
Nov. " " " ..	60 00						
Dec. " " " ..	35 00			Balance 198 91			
	$1,031 12			$1,031 12			
1884.							
Jan. 1. To Cash on hand....$198 91				Total expenditures.........$832 21			

DETAILED STATEMENT OF EXPENDITURES.

Treasurer's expenses................................. $34 73
Rent and Janitor's fees and coal............................ 356 75
Gas........................ .... 8 53
Recording Secretary's expenses........................... 39 50
Journal... .... 373 20
Insurance.......................... .... 6 00
Corresponding Secretary's expenses...................... 11 00
Curator's expenses......... .... 2 50

$832 21

Respectfully submitted,

T. O'CONNOR SLOANE
Treasurer.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—February 1st, 1884.

Vice-President Leeds in the chair.

The minutes of the January meeting were read. As only twelve members were present, there was no quorum, and eight nominations could not be acted upon.

Mr. Stebbins suggested that Article 3 of the Constitution be amended so that the quorum be reduced from 15 to 10 members, according to Article 10. Mr. Stebbins suggested that the Secretary be requested to notify the Directors that a meeting of the Board be called for Tuesday, February 12th, at 4 P. M., at 117 Pearl Street.

Prof. Breneman spoke of appointing the third member of the Committee on Papers and Publications, and recommended Prof. Leeds as that third member. This was ratified by a unanimous vote.

The Librarian reported the receipt of a work on Explosives by Berthelot from the author.

The following papers were then read:

1. A Flashing Test for Gunpowder, by Prof. C. E. Munroe, of Annapolis, Md.

2. An Instance of the Spontaneous Decomposition of Explosive Gelatine, by Prof. C. E. Munroe.

3. Benzureïde, by Prof. A. R. Leeds.

4. Atomation (second memoir) of Oxygen at Elevated Temperatures, Production of Hydrogen Peroxide and Ammonium Nitrite, and the Nonisolation of Ozone, in the burning of purified Hydrogen and Hydrocarbons in purified Air, by Prof. A. R. Leeds.

The Society then adjourned.

CHARLES E. MUNSELL,
Recording Secretary.

Additions to the Library of the American Chemical Society

During January and February, 1884.

PRESENTED BY THE AUTHORS.

Presented by Mr. Berthelot:
"Sur la Force des Matieres Explosive d'apres la Thermo-chimie." Troisiéme Edition, 1883, 2 vols.

Presented by J. S. Newberry, Ph. D.:
"The Origin of the Carbonaceous Matter in Bituminous Shales." Pamphlet.

ACQUIRED BY GIFT.

Presented by the Central Meteorological Observatory, Mexico:
"Anales de Ministerio Fomento de la Republica Mexicana." Vol. VII.

Presented by the American Society of Microscopists:
"Micrometry. History of the National Committee." Pamphlets.

Presented by the Geological and Natural History Survey of Canada:
"Geological and Natural History Survey of Canada. Report of Progress for 1880-81-82.

Presented by Messrs. Waring and Williams:
"Chart of Alchemical Notation."

Presented by the Connecticut Agricultural Experiment Station:
"Annual Report of the Connecticut Agricultural Experiment Station for 1883."

ACQUIRED BY EXCHANGE.

With the Bureau of Statistics, Washington, D.C.:
"Quarterly Report of the Bureau of Statistics." No. 1. 1883-84.

"Statistical Abstract of the Reports of the United States." 1883. Sixth number.

"Annual Report of the Chief of the Bureau of Statistics for the fiscal year ending June 30th, 1883."

The following exchanges are regularly received and on file at the rooms of the Society:

AMERICAN.

American Chemical Journal.
American Gas Light Journal.
American Journal of Pharmacy.
American Manufacturer and Iron World.
American Druggist.
Annals of the New York Academy of Sciences.
Anthony's Photographic Bulletin.
Chemical Review.
Deutsch-Amerikanische Apotheker-Zeitung.
Engineering and Mining Journal.
Journal of the Franklin Institute.
Manufacturer and Builder.
Manufacturer's Review and Industrial Record.
New York Medical Journal.
Oil, Paint and Drug Reporter.
Popular Science Monthly.
Proceedings of the Academy of Sciences of Philadelphia.
School of Mines Quarterly.
Transactions of the American Society of Engineers.
Transactions of the New York Academy of Sciences.
Textile Colorist.

ENGLISH.

Chemical News,
Chemical Review.
Engineering.
Journal of the Chemical Society.
Journal of the Society of Arts.
Pharmaceutical Journal and Transactions.

FRENCH.

Annales des Mines.
Moniteur des Produits Chimique et de la Droguerie.
Moniteur de la Teinture.
Repertoire de Pharmacie et Journal de Chimie Medicale.

GERMAN.

Berichte der Deutschen Chemischen Gesellschaft.
Bierbrauer.
Deutsche Gerber Zeitung.
Oesterreichische Zeitschrift fur Berg-umd Huettenwesen.

Polytechnisches Notiz-Blatt.

Sitzungsberichte der. K. K. Akademie der Wissenschaften zu München.

Verhandlungen der K. K. Geologischen Reichsanstalt.

Verhandlungen der Kaiserlichen Akademie der Wissenschaften in Wien.

ITALIAN.

Archivio di Chimica.

Gazetta Chimica Italiana.

MEXICAN.

Boletin de Ministerio de Fomento de la Republica Mexicana.

RUSSIAN.

Pharmaceutische Zeitschrift fur Russland.

A FLASHING TEST FOR GUNPOWDER.

Chas. E. Munroe, S. B. (Harv.)

Among the methods in use for the determination of the condition and quality of gunpowder, is the "flashing test." According to the *Ordnance Instructions U. S. Navy, pg.* 345, " about eight drams of powder are poured on a glass plate so as to form a conical heap, and 'flashed' by applying a hot iron ; no residuum should be left and only a few smoke marks should be seen on the plate." Capt. Smith, R. A., in his *Handbook of the Manufacture and Proof of Gunpowder, pg.* 83, proceeds in the same way, but he places the powder in a thimble-shaped, copper cylinder "which is then inverted on the flashing plate. This provides for the particles being arranged in pretty nearly the same way each time, which is an all-important point in flashing. The decomposition of the powder will be more thorough if it be thrown together in a conical heap, than if it be spread out in a thin layer on the plate, hence, for comparison of different powders, they should be placed on the plates as nearly as possible under the same conditions.

If the powder has been thoroughly and effectually incorporated the small charge placed on the plate will 'flash' or puff off when touched with a hot iron, leaving only smoke marks on the plate. A badly incorporated powder will, on the other hand, leave specks of undecomposed saltpetre and sulphur, and will therefore give a dirty residue. But the 'flashing' test, though apparently most simple, is one which, like the examination by eye and hand, requires experience to enable the observer to form an accurate judgment. Though a very badly incorporated powder could be detected at once, it is by no means easy to judge between two powders, both tolerably good, as to which has undergone the most thorough incorporation. Flashing should therefore be constantly practised with all classes of powders, and it is useful to keep some samples of bad powders to flash occasionally for comparison. Powder which has once been subjected to and injured by damp will be found to flash very badly, no matter how carefully its incorporation may have been performed. This arises from a partial solution of the saltpetre having taken place, causing a consequent disturbance of the incorporation."

Comdr. J. D. Marvin, U. S. N., in his *Objects and Resources of the Naval Experimental Battery, pg.* 18 repeats the above directions and suggests weighing the plate on which the flash has been made,

but, as he provides no means to prevent the absorption of moisture
and oxygen and the escape of the hydrogen and ammonium sul-
phides, the method is of no value.

In the *Comptes Rendus* 78, 1138 ; 1874, Col. Chabrier proposes,
what he terms a *pyrographic* method for the examination of gun-
powder and a detailed account is given in the *Revue d' Artillerie*
4, 396 ; 1874, of its application by the *Comité de L'Artillerie* in
determining the relative value of wheel mills, stamp mills and
moulins à tonneaux in effecting incorporation and of the length of
time necessary in each case to produce the desired result.

This method consist in flashing the powder on sheets of paper,
colered blue with iodide starch.   Sheets of uniform tint, 0.30 meter
long by 0.15 meters wide, are dampened and placed on a plate of
glass of the same size.   A half gram of powder is then trailed on
the paper, following the longer axis.   It'is flashed by a red hot, iron
wire and it is found that the centre of the blue paper is bleached,
while black spots and streaks appear on the white ground and
white spots on the blue ground.   The size and shape of the bleached
space and the number and arrangement of the spots and streaks
are determined by the character and amount of the powder used.
Col. Chabrier does not give the rationale of his process but it is to
be inferred from the fact that he styles these results *pyrographic*
images, that he believes the bleaching to be due to the heat evolved
by the combustion.   The well known experiment of the bleaching
of starch paste, colored blue with iodine, by heating in a test tube,
is an example of the same kind.

This process is an advance upon the older one but in applying it
some years ago I found it difficult to prepare papers of the same
degree of blueness and that the evanescent character of the color
made it difficult to preserve the test papers intact for any consider-
abe length of time ; so, as before, we must either practice the method
continually or else flash powders, which we have kept as standards
for comparison, with each set of tests we make, in order to arrive
at any good results.   Or, finally, we may photograph the test papers,
but this involves considerable labor and the loss of the color.

Since the flashing test is the simplest, readiest, and in the hands
of an expert, the best test for the incorporation of powder, and,
since it also fairly indicates the amount of deterioration which a
powder has undergone during transportation and storage, it has
seemed to me desirable to seek some method by which the record
could be made permanent.   Such a record could then be filed at

the factory with the other data concerning a given powder, or, in the case of the Government, they could be inclosed with the quarterly returns of the inspecting officers at distant stations, to be examined by some expert in the Bureau. Specimens of the tests of standard powders could also be furnished inspecting officers, to guide them in the interpretation of the results of their tests, and finally, a sample of the required test might be attached to the specifications for a gunpowder to be purchased.

After some search I believe that I have secured such a permanent record, by employing a paper colored with Turnbull's Blue, upon which to make my flash. This paper is the same as that used in the " Blue Print Process " of photography, and is easily procured in commerce. The use of the paper was suggested by the following facts. When gunpowder burns, the reaction which takes place may, according to Debus, *Proc. U. S. Naval Institute*, 9, 76, 1883, be represented by the reaction $16 \ KNO_3 + 13C + 5S = 3K_2 CO_3 + 5K_2SO_4 + 9 CO_2 + CO \times 8 N_2.$

Since, however, in ordinary gun powders there is more carbon and sulphur than is required by the above equation, secondary, endothermic reactions take place, which may be combined and represented as follows: $3K_2 SO_4 + 2K_2 CO_3 + 7C + 7S = 5K_2 S_2 + 9C O_2.$

Further, on exposure to the air, the polysulphides formed are oxidized to thiosulphates. I have observed that, in my experiments, the characteristic smell of the latter was most noticeable when the powder was badly incorporated.

It is well known that solutions of the alkalies and the alkaline carbonates decompose Turnbull's Blue and thereby destroy its color. Advantage has been taken of this reaction to increase the distinctness of " Blue Prints," or to make such additions to them or alterations in them as desired. With this I exhibit a specimen of the blue paper, upon which one of the above reactions is written by the aid of a solution of potassium carbonate. The alkaline sulphides and thiosulphates also act upon the blue paper, but with less intensity and with the partial production of a yellow color. By flashing gunpowder then, upon such paper, yellow and white spots will be formed through the action of the substances formed by the reaction.

The test is made as follows: Pieces of the paper, from 15 to 20 centimetres square, are dampened and placed on a sheet of glass or copper. A truncated leaden cone 3 centimetres in capacity is closed

with the finger at the smaller end, filled evenly with powder and inverted on the paper. The result is a conical heap. The heap is immediately fired, either by a hot iron or copper wire, or, as in my experiments, by a fina platinum wire, heated to incandescence by an electric current. The paper is exposed to the action of the residue for thirty seconds and then immediately placed under the spigot and washed with running water. When pulverized gunpowder cake is used it will be found that the space described by the base of the cone, has been blackened and partially bleached by the dampened layers of powder in contact with it; that about this space are black smutches and streaks, and that the whole surface of the paper is marked by white and yellow dots. Where the powder is badly incorporated the spots are coarse, and irregular in shape and distribution; where the incorporation is complete, the spots are fine and quite uniformly distributed over the surface so that the paper appears but of a paler blue, with occasional spots and few streaks.

With this, I forward specimens of tests made with powdered "mill cake." All of the specimens belong to the same "charge," but the first was drawn after the mill had been running four hours; the second, at the end of eight hours; the third, after twelve hours; and the fourth, after sixteen hours. The latter is known as the "finished composition." This length of running is rather unusual, but the charge used at the mills is greater than common. The tests exhibited were made October 19, 1883. I have yet others made April 26, 1883, which are to-day apparently as fresh and distinct as when made. It is believed that the papers show what is described above. That importance is given, in interpreting the results, to uniformity of the bleaching and in the arrangement of the spots, depends upon the fact that gunpowder is a mechanical mixture, and, therefore, that the regularity of the combustion and the uniformity of the accompanying reactions must depend upon the fineness of the ingredients and the intimacy and uniformity of the mixture. If the ingredients are coarse, and the mixture imperfect, the combustion will go on slowly and irregularly, and the resulting globules of residue will be of considerable size and be deposited near the centre of action. If the incorporation is complete, the reaction will take place nearly simultaneously throughout the whole mass, and the globules will be, as a rule, quite small and projected to some distance. This interpretation is for mealed powders having the same formula. I have not yet been able,

personally, to extend my experiments to granulated powders or powders of varying proportions and ingredients, but I believe that this test will form a useful method for the study of these powders.

In order that the indications may be interpreted aright, it is necessary that the conditions, under which the experiments are made, shall be as nearly uniform as possible, and the first of these is that the color of the test paper should be in all cases as nearly as possible of the same depth. The paper may be purchased in an emergency but it varies among manufacturers owing to the many different formulas according to which it is made. Among these I have selected that issued by the Penn. R. R. Co. for use among its operatives.

"Take 10 oz. (283.5 c. c.) of clean water and put in an opaque bottle, add 1¼ oz. (35. 44 grms), of Red Prussiate of Potash, allow this to dissolve. In a second vessel containing 6 oz. (170. 1 c. c.) of water put 2½ oz. (70. 88 grms), of Ammonio-citrate of Iron, allowing this also to dissolve. Add the second liquid to the first and shake thoroughly. Keep closely stoppered and not exposed to light."

"In a room, from which daylight is excluded, but where lamp or gas light may be used, the paper to be printed on, is laid on a table, and the fluid applied with a *clean* sponge. Care should be taken to apply the fluid as evenly as possible, and every part of one side should be gone over. For that reason it would be well to sponge the paper, first in one direction, and afterwards crosswise to the first. When a sheet is sensitized it is put away in a drawer to dry, but never place one sheet on the top of another before they are dry; afterward it makes no difference. Sensitized paper may be kept in a drawer for a week or more, without injuring its sensitive quality."

"In using the fluid, care should be taken to pour out no more than is needed for the time, as it would be apt to spoil the fluid in the bottle if any fluid which had been used, was poured back again. For the same reason the saucer into which the fluid is poured, and the sponge with which it is applied, should be washed out immediately after using and also before using."

For the purposes of this test for gunpowder the dry sheets are now exposed to strong sunlight for four or five hours. When about to use, immerse in running water for five minutes, lay on the

plate of glass and remove the excess of moisture by aid of filter paper or a blotter. The paper must be thoroughly moistened but without "standing" moisture.

Since writing the above I have received from Lt. Commander W. M. Folger, U. S. N., commanding the Naval Experimental Battery, the following statement concerning the testing of a granulated powder by this method.

"In firing a sample of experimental powder lately, I had reason to believe, from its performance in the gun, (calibre 6"), that the powder was badly incorporated. Tested in the manner you suggested with Turnbull's paper and following all your directions, indications were furnished which (when compared with results obtained with a normal sample of approved powder) verified most definitely the value of the method you suggest."

SPONTANEOUS DECOMPOSITION OF EXPLOSIVE GELATINE.

Charles E. Munroe, S. B. (Harv.)

Several instances of the decomposition of explosive gelatine on keeping or after long exposure to moderate temperatures, have been reported, but I have yet met with but one of these cases in which the products of the decomposition have been stated. Gen. H. L. Abbot, in a prefatory note to Addendum I, Report on Submarine Mines, states that "all the samples of the explosive gelatine remaining on hand after the trials detailed in the Report, have undergone spontaneous decomposition, separating into cellulose and free nitro-glycerine with the copious evolutions of nitrous fumes. This change occurred during the winter and spring of the current year (1881-1882), and was not caused by any exposure to high temperatures while in store."

A case of spontaneous decomposition of a small amount stored freely exposed to the air, in a room of fairly even temperature and dryness, has occurred under my own observation. The camphorated explosive gelatine was wrapped in paraffine paper, and then in light brown Manilla paper, and laid on the shelf. After something more than one year's exposure it was found, in the early winter, to be giving off nitrous fumes (which had stained and attacked the wrapping paper), and to have shrunk considerably in volume, while the outside of the paper was covered with congeries of fine crystals. The odor of camphor was still quite strong. The mass was immediately put into a vessel of water. It was found to be friable, and, after a short immersion, disintegrated. The camphor odor soon disappeared, and the water became of a straw color, gave a strong acid reaction, and showed traces of nitrous acid, but no nitric acid. On evaporation of the filtered liquid, oxalic acid crystallized out in quantity, and on evaporation of the "mother liquor" on the water bath, a sugar-like mass was obtained, which gave the glucose reaction with Fehling's solution. The paraffine was regained unchanged, and the paper was recovered, but in a flocculent condition, and with the color bleached from the brown. Careful search failed to reveal the presence of glycerine, nitro-glycerine, or gun-cotton. The cellulose from the gun-cotton could not well be detected (if it existed) in the presence of so much flocculent cellulose from the paper. In reporting these observations I am not unmindful of the fact that some changes may have taken place during immersion, but it can easily be understood why I preferred it in that position.

The results obtained by de Luca in his "Researches on the Spontaneous Decomposition of Gun-Cotton," *Comptes Rendus* 59,487, *Sept.* 12, 1847, are interesting in this connection. Gun-cotton decomposes most rapidly when heated to 50° on a water bath, next by direct sunlight, more slowly by diffused light, and very slowly in darkness. The gun-cotton first shrinks to one-tenth of its original volume, next it begins to become gum-like and sticky, then it swells ; during all these phases it gives off nitrous fumes, but especially during the last. For the fourth phase the gas ceases to be evolved, and the mass becomes brittle, and of a light color like sugar. The products are nitrous compounds, with formic and acetic acids in the state of a gas, and an amorphous, porous, sugar-like body, almost entirely soluble in water, and containing an abundance of glucose, gummy matter, oxalic acid, a small quantity of formic acid, and a new acid of which he obtained the lead and silver salts for later examination. From 100 grains of gun-cotton he obtained about 14 grains of glucose.

In discussing the stability of nitro-glycerine (which is the other component of explosive gelatine), A. Brull, in *Etudes sur la Nitro-glycérine et la Dynamite, fig.* 26, 1875, says : "Nitro-glycerine which retains traces of acid is not stable. In general the decomposition is extremely slow and tranquil. It disengages at first nitrous fumes, and the liquid takes a greenish color ; then it generates nitrogen protoxide, carbon dioxide and crystals of oxalic acid, and after some months the entire mass is found to be converted into a greenish, gelatinous mass, composed of oxalic acid, water, and ammonia. Sometimes, if the temperature is quite high—if for example, the nitro-glycerine is heated by the sun, the decomposition is more active. Very rarely it causes an explosion."

The source of difficulty, then, seems to be in the presence of free acid, and this will probably be found in the gun-cotton used, for it is difficult to purify soluble gun-cotton completely.

BENZUREÏDE.

By Albert R. Leeds.

In the Ann. Chem. Pharm., vol. 151, p. 192, Schiff describes the products obtained by the action of Benzaldehyde on Urea. I have had occasion to repeat this work, and have obtained the following results.

Two molecules of urea were dissolved in alcohol and added to one molecule of benzaldehyde. Sufficient alcohol was added to dissolve the urea in the cold, and the flask containing the solution was allowed to stand, loosely plugged with cotton wool, for several weeks. Minute, crystalline needles were slowly deposited. They were purified by washing with ether and dried over sulphuric acid. They yielded on analysis C 52.04 p. ct. and H 5.85 p. ct. (theoretical C 51.92 p. ct., H 5.77 p. ct.), and proved to be the Benzodiureïde of Schiff.

$$C_9H_{12}N_4O_2 = \begin{matrix} CO \diagup NH_2 \\ \diagdown NH \\ \diagup NH \\ CO \\ \diagdown NH_2 \end{matrix} \Bigg\} C_7H_6$$
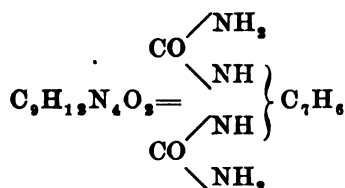
Urea and benzaldehyde, dissolved in alcohol in the cold, were added together in the proportion of three molecules of urea and two molecules of benzaldehyde. The solution was heated in a flask connected with a return cooler for a number of days upon a water bath. Most of the alcohol was finally expelled, when the compound crystallized out in very brilliant, white needles. After purification by washing with ether they gave, on analysis, the formula of dibenzotriureïde, C 56.46 p. ct., H 6.00 p. ct. (theoretical C 56.66 p. ct., H 5.88 p. ct., or

$$C_{17}H_{20}N_6O_3 = \begin{matrix} CO \diagup NH_2 \\ \diagdown NH \\ \diagup NH \\ CO \\ \diagdown NH \\ \diagup NH \\ CO \\ \diagdown NH_2 \end{matrix} \begin{matrix} \Big\} C_7H_6 \\ \\ \Big\} C_7H_6 \end{matrix}$$
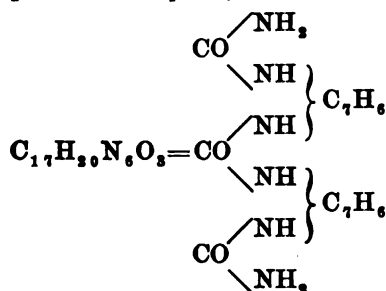
Deeming it probable that the simplest form of combination between urea and benzaldehyde or benzureïde might be found by varying the conditions of the reaction, the experiment was tried of introducing the two substances, dissolved in absolute alcohol and in molecular proportions, into a sealed tube. This was heated for 48 hours at a temperature of 95°, at the expiration of which time an abundant porcelain-like, white deposit had formed. No pressure was noted on opening the tube. Its contents, after purification, were found to consist of fine, white, crystalline needles. On analysis they gave C 56.56 p. ct. and H 6.18 p. ct., showing that the substance thus formed was not benzureïde but dibenzotriureïde. It does not melt, but begins to decompose and give off a crystalline sublimate at 200°.

The dibenzotriureïde was described by Schiff as a compact, crystalline mass, in which no especial form could be recognized, and for which he gives no melting point or analysis.

ATOMATION (2d PAPER). ATOMATION OF OXYGEN
AT ELEVATED TEMPERATURES, AND THE PRODUC-
TION OF HYDROGEN PEROXIDE AND AMMONIUM
NITRITE, AND THE NON-ISOLATION OF OZONE, IN
THE BURNING OF PURIFIED HYDROGEN AND HY-
DROCARBONS, IN PURIFIED AIR.

BY ALBERT R. LEEDS.

It has heretofore been established, by the fact of the conversion
of carbon monoxide into dioxide during the slow oxidation of phos-
phorus, that the formation of ozone, hydrogen peroxide and am-
monium nitrite, in the course of this eremacausis, is preceded by
the resolution of the oxygen molecule into its constituent atoms.
The converse of this proposition, viz.: That when oxidation occurs
with the contemporaneous formation of the three products enu-
merated, this oxidation has been preceded by the production of
atomic oxygen, has not as yet been satisfactorily established, and
awaits experimental proof.

The object of this second paper is to present the conflicting tes-
timony as to whether these three bodies are formed during the
rapid combustion of hydrogenous substances, and the results of a
new experimental inquiry.

According to Schönbein, the formation of ozone occurred in all
cases of slow oxidation in presence of atmospheric air. Moreover,
that when readily oxidizable metals, like zinc and iron, were agi-
tated in contact with air and water, hydrogen peroxide was formed.
Also, that ozone, in presence of air and moisture, would generate
ammonium nitrite.

This last statement, after long controversy, has been satisfac-
torily disproven by Carius.* Satisfactorily, because Berthelot†
working independently and at a later period, has entirely confirmed
the results obtained by Carius. It has thus been established
beyond reasonable doubt, that ozone in presence of moist atmos-
pheric air or moist nitrogen will generate neither ammonium
nitrite or nitrate.

At the same time it is no less certain that in the slow oxidation
of phosphorus, the contemporaneous formation of ammonium nitrite,
ozone and hydrogen peroxide takes place. And whilst the ob-
servations of Schönbein and others, as to the occurrence of the same

*Ann. der Chem. CLXXIV, 81.
†Compt. Rend. LXXXIV, 61.

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phenomena in the course of the slow oxidation of metals, have not
been reinvestigated with the same minuteness as the oxidation of
phosphorus, yet it is eminently probable that the correctness of his
labors in these particulars will be eventually vindicated. In this
connection, ;the recent controversy and final establishment of the
fact of the production of both hydrogen peroxide and ammonium
nitrite, when the hydrogen in palladium hydrogen undergoes slow
oxidation in presence of air and moisture is very instructive.

After the researches of Marignac, Andrews, Soret, Brodie and
others, had elucidated the true nature of ozone, a very different
interpretation was put upon many of the experimental results
obtained by Schönbein, from that put forth by their original
observer. Instead of regarding, as Schönbein did, ozone or the
fictitious antozone, as the starting point in certain sequences of
phenomena, the hypothesis was advanced in various quarters, that
the real starting point was an initial change in the oxygen mole-
cule, necessarily antecedent to all the observed phenomena.

In any new investigation of this topic it is but just to previous
observers to rehearse the history of their labors, and in so doing
the difficulties encountered are of two kinds :   1st. To ascertain in
regard to particular experiments whether the reactions noted were
in reality due to their ascribed causes.   2d. To restate the thoreti-
cal explanation of these phenomena in the light of the present
universally received doctrines concerning the true nature of ozone.

One of the earliest observations, relating to the subject matter of
the present paper, was that contained in a brief communication
made to the Lyceum of Natural History of New York in 1869, by
Loew.*   His experiment was of a very simple nature. He blew a
strong current of air through a fine tube into the flame of a Bun-
sen's burner, and collected the air in a beaker glass or balloon. He
stated that in the course of a few seconds, sufficient ozone could be
collected in this manner to be identified by its intense odor and the
common tests.

Subsequently, a large apparatus containing many jets and
burners, was patented by Loew and applied to the mellowing of
whiskies by means of the "ozone" thus formed.†

The production of ozone in the manner described, was imme-
diately denied by Boeke, who substituted a blast of oxygen for the

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*Chem. News, XXII, 13.
†Wagner's Jahresb. 1874, p. 404; Dingl. polyt. Jour. CCXIII, 306.

air expired from the lungs, and obtained from the gaseous products the reactions and odor of a compound of nitrogen and oxygen.[*]

Böttger likewise denied the accuracy of Loew's results, but upon altogether different grounds.[†] He detected no ozone in air blown through the flame of a Bunsen burner, but ammonium carbonate (which he regarded as a regular constituent of air expired from the lungs), and hydrogen peroxide. In reply to these criticisms Loew repeated his experiments, using instead of expired air, a bellows and a large Bunsen burner, and stated that in this manner he filled, in a short time, a large room with the peculiar odor due to ozone, while delicate tests failed to detect any peroxide of hydrogen or ammonium carbonate.

Similar experiments were performed by Than.[‡] This observer aspirated the products of combustion from the lower edge of the flame of a Bunsen burner through an acidulated solution of potassium iodide and starch. A blue coloration was speedily produced, the air in the wash-bottle smelling distinctly of ozone. When pure water was used as an absorbing solution and subsequently tested with potassium iodide and starch, no blue color was developed. From this negative result the absence of ammonium nitrite was inferred, and from the previous affirmative result the presence of ozone. But the formation of ammonium nitrite as a product of combustion of hydrogen has since that time been established beyond doubt, whilst the reactions for ozone obtained by Than permit of other explanations.

Similar objections apply to the experiments performed by Struve (1871),[§] who endeavored to prove that ozone, hydrogen peroxide, and ammonium nitrite are all present in the products of combustion of hydrogen. The gas was burned beneath a long drawn-out funnel, and tests were made for ozone at the upper end of the funnel, whilst the water condensed on its sides was collected and examined for hydrogen peroxide and ammonium nitrite.

In Poggendorff's Annalen for 1872 (p. 480), a summary is given of the results obtained by Pincus upon the formation of ozone, when thoroughly purified hydrogen gas was burned in atmospheric air. The gas was burnt with the smallest possible lens-shaped flame from a metal jet. According to Pincus, when a cold and clean

[*]Chem. News, XXII, 24.
[†]Chem. Centr. 1870, p. 161.
[‡]J. pr. Chem. [2] I, 415.
[§]Zeitsch. anal. Chem, X, 292.

beaker glass was held over the flame the contents of the beaker
possessed as powerful an odor of ozone as the interior of a charged
Leyden jar.   When pure oxygen was substituted for atmospheric
air in a properly constructed apparatus, the same phenomena
occurred, showing that the nitrogen of the air was not essential to
its development.

The merit of having established, by rigorous experimental proof,
the formation of ammonium nitrite by the burning of hydrogen
thoroughly purified in thoroughly purified air, is due to Zoeller and
Grete.†   In their apparatus the air and hydrogen were purified by
passage through potassium permanganate, potash, sulphuric acid,
and Nessler's reagent, and the absence of both nitrous acid and
ammonia in the gases prior to combustion, most carefully demon-
strated.   The hydrogen was burnt in a jet 3 to 4 m.m. high issuing
from a platinum blowpipe tip.   The ammonia formed by combus-
tion was converted into ammonio-platinum chloride, the nitrous
acid was identified by diamido-benzole and other tests. Nitric acid
was sought for, but no reaction for it was obtained.   The authors
make no mention of either ozone or hydrogen peroxide.

In entering upon the present investigation of this difficult topic,
it was with the hope of constructing an apparatus in which, by the
use of completely purified gases, and the elimination of all surfaces
of contact with organic bodies, it would be possible to decide
whether at one and the same time, ozone, hydrogen peroxide, and
ammonium nitrite (and possibly nitrate) were formed in process of
combustion of hydrogenous substances.

The apparatus employed is figured in the accompanying cut.
The combustion chamber A consists of a tall glass cylinder 80 c.m.
in height and 6 c.m. in diameter, with a globular enlargement.   At
the bottom it connects, by a tube passing through a stopper of
ground glass, with the receiving vessel G. This vessel communi-
cated with the bottle H, whose stopper K is provided with a
platinum hook fused in to its lowest part.   H communicates with
the wash-flasks M and N, by tubes passing through their mouths
and ground into them air-tight.   The entrance-tube B passes
through the ground glass joint C, and is fused to the platinum jet
D. Platinum wires connected with a coil are twisted into a very
small spiral E, which is interrupted so as to allow of the passage of
a spark immediately above the jet.   At the upper portion of the

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†Ber. Bericht. X, 2144.

chamber A there is a lateral tube connected with a wash-flask F, which is provided with an entrance-tube passing through its stopper of ground glass.
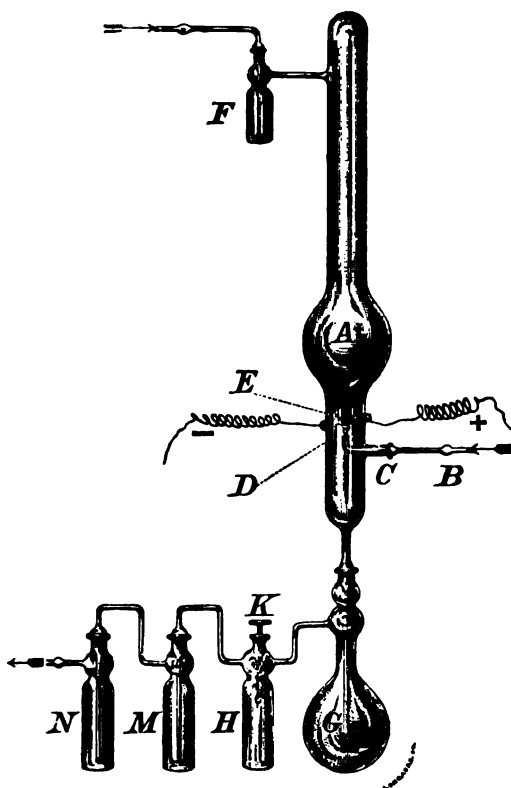
In the performance of the experiments, the air, after passage through a long tube filled with ignited asbestus, was passed through water, potassium permanganate, potash, sulphuric acid, and Nessler's reagent, entering at the upper end of the combustion chamber by the wash-flask F. It encountered the hydrogen similarly purified at E, and combustion was brought about by passage of the spark at this point. The platinum spiral was made very small so as to be contained within the outer surface of the flame. This was done to obviate the possible error due to the contact of platinum at high temperatures with the mixed gases. At the same time some device of this character was necessary, since the perfectly

purified hydrogen gave an invisible flame and it could not be cer-
tainly known, except by the incandescence of the platinum, whether
the flame had gone out or not. Without the platinum, extinction of
the flame was very apt to occur, but with the platinum this never
happened. The products of combustion flowed down into G, in
which vessel and in H and M they were entirely condensed, these
vessels being kept cold by ice. N contained a solution of potas-
sium iodide, free from iodate and other impurities.

On opening the apparatus, in none of the trials was the odor of
ozone noted. The potassium iodide alone, or after addition of
starch water, was never affected when pure hydrogen was burned.
When illuminating gas was used, the potassium iodide solution gave
no indications of decomposition by ozone, on application of tests.
If starch was added to it, a faint reddish precipitate was formed.
On filtering off this precipitate, washing thoroughly with water, and
allowing it to remain in contact with air, it became violet in color.
Unfortunately the amount was so small that the nature of this yel-
low precipitate could not be determined with certainty. Aldehyde,
passed into a solution of potassium-iodide starch, yielded a yellow
precipitate, turning first violet and then blue on exposure to air.
But these experiments are apart from the main purpose of the in-
vestigation, and the deportment of potassium iodide alone or with
starch, sufficiently established the fact that no ozone passed through
the wash bottle N.

The condensed water gave an intense reaction with the Griess's
tests. When pure hydrogen was used the percentage of nitrous
acid was 0.005 parts in 100,000, that of ammonia 0.002 parts per
100,000. These quantities are in the proportion corresponding to
ammonium nitrite. The amount of hydrogen peroxide much ex-
ceeded that of ammonium nitrite, being 17 parts per 100,000. The
various tests for hydrogen peroxide in which potassium iodide
enters as one of the constituents, were not relied upon as conclu-
sive, since the results obtained might have been due to other
substances possibly present. But the condensed water gave in
addition an intense blue color with fresh cold extract of malt and
fresh guaiacum tincture. Moreover, it developed with solution of
chromic acid a strong blue color, the last being regarded as the
most satisfactory of the tests applied to prove qualitatively the
presence of hydrogen peroxide. No nitric acid was detected.

The amounts of nitrous acid, ammonia, and hydrogen peroxide
obtained when purified illuminating gas was burned, were not de-

termined, but the qualitative tests applied to establish their presence were the same as those used in the case of pure hydrogen, and were equally satisfactory.

It should be observed that an apparatus of the character described is not well adapted to settle the question of the possible formation of ozone. The products of the combustion could not be rapidly withdrawn from the influence of the elevated temperatures in the immediate vicinity of the flame, and any ozone formed could readily have undergone decomposition. The experiment is a failure, in so far as its bearing upon the validity of the observations made by preceding observers is concerned. In all of their experiments the immediate withdrawal of the products of combustion is an essential feature. In repeating their experiments, if other evidence than that afforded by the powerful odor of ozone is sought for, it would be necessary to obtain the absorption spectrum of ozone and the blackening of silver. Under the conditions of the experiment, other qualitative tests for the presence of ozone would be open to question. The amount of ozone necessary to yield these decisive proofs however is much greater than that which could possibly be obtained in any trial where all the essential precautions are observed. For these reasons further experiments are abandoned.

The final conclusion reached is the *certain formation* of hydrogen peroxide and ammonium nitrite, and, in view of the fact that the statements of others concerning the presence of ozone have not been disproven, the *possible formation* of ozone.

ABSTRACTS.

Journal of the Society of Chemical Industry. Vol. II., p. 488. December 20th, 1888. London Section.

On a New Residual Product from Coal Gas. H. L. GREVILLE

The product under consideration is carbon disulphide. Incidentally the process of purifying gas at the Commercial Gas Works, where the experiments were made is described. Lime is used to remove the CO_2 and iron oxide to remove the H_2S. To remove the CS_2, of which there are about 30 or 48 grains in the 100 feet of crude gas, purifiers are used containing lime through which gas has been passed containing H_2S but no CO_2. When saturated, the lime has a bright orange-red color. By distilling this lime with water CS_2 was obtained, amounting to between 1 and 2 per cent. on the amount of substance taken. Picked specimens yielded 3 to 4 per cent. The lime remaining in the retort is suitable for re-charging the lime purifiers. The author proposes to use the CS_2 to extract the sulphur from the iron oxide. Since the authorities on the subject say that boiling sulpho-carbonates with water yields H_2S and not CS_2, it is surmised that the orange-red compound obtained is something other than calcium sulpho-carbonate. The author is engaged in an investigation of the subject.

In analyzing the material it is distilled with lead acetate, the CS_2 in the distillate being converted into xanthate by being caught in solution of alcoholic potash. This product is then oxidized by potassium permanganate, the excess of permanganate destroyed by oxalic acid, and the sulphur determined as barium sulphate. In weighing out portions of crude CS_2 for analysis the method of weighing an alcoholic solution of potash in a flask, dropping in the CS_2 and weighing again, was found to be the most satisfactory plan.

In the discussion which followed, Mr. S. H. Johnson stated that when the price of sulphur was £4 per ton or less, it would not pay to extract the sulphur from the spent oxide of the purifiers.

E. W.

Note on the Stassfurt Potash Industry. (P. 492.) C. N. HAKE.

By agreement between the owners of the Stassfurt mines, the daily out-put of Carnallite is to be limited to 3,000 tons daily, sup-

plied by five companies.   In July two other mines will participate
in the production.   No limit has been as yet placed on the out-put
of Kainite.   E. W.

Liquid Carbonic Acid Under Regulated Pressure.   (P. 493.)   A. ZIMMERMANN.

A cylinder containing 10 litres of liquid carbonic acid under
36 atmospheres pressure was exhibited, and the construction of the
cylinder described.   The use of the gas evolved from the cylinder
for cleaning beer, and at the same time giving it a sparkle, was
practically illustrated.   ·   E. W.

LIVERPOOL SECTION.

Analytical Examination of Tars Recovered in the Coking of Coal by the Jameson and the Simon Carve's Processes, and in the Condensation of the Fuel Gases from Blast Furnaces by the Alexander and McCosh Process. (P. 495.)   W. SMITH.

To prepare the samples for fractional distillation, the tars were
kept for several hours in vessels surrounded by warm water, and
as much as possible of the water separating, decanted off.   After
placing about 2½ litres of the tar in a retort, the temperature is
brought to 60 or 70° C. and kept there for some time, a slow cur-
rent of air being passed through the tar in order still further to
remove the water.   After the removal of the water in this way,
the distillation may be conducted without danger of frothing.

The table of comparisons of the different yields on distillation
of the tars is as follows in percentages:

Tempera- ture C.	Jameson Oven No. 2.	Coke ovens, Oven No 3.	Blast Fur- nace.	Simon Carve's.
Below 150	0.8	1.1 ⎫	4.2	6.7
230	9.2	22.9 ⎭		
300	36.0	37.7	10. ⎫	19.8
350	6.7	10.5 ⎫	18.8 ⎬	36.5
400	19.0	13.8 ⎭		
About 400° and upwards.	15.3	8.9	24.1 ⎭	

The crude phenols from the blast furnaces contain more carbolic acid and cresols, than those from the Jameson coke ovens.

E. W.

The Patent Law as Amended in 1883. (P. 501..) W. P. Thompson. MANCHESTER SECTION. E. W.

On Gaseous Fuel. (P. 504.) L. T. WRIGHT.

The percentage value of the different products to gas companies is thus stated :

	Gas.	Coke.	Tar.	Ammonia.	Sundries.
Nottingham, 1881 and 1882,	75.06	8.29	8.21	3.27	5.17
South Metropolitan, 1883,	72.05	15.18	5.34	7.04	.39
Gaslight and Coke Co. 1883,	78.47	11.43	2.98	6.86	.26
Compagnie Parisienne, 1881,	70.70	18.00	3.41	1.91	6.00

The store of heat in the gas is about 17 per cent. of that in the coal. The following is a summary of the results calculated on the cost of to a consumer of different materials which might be offered as fuels:

Fuel.	Cost.	Average Caloric (Kilo-cent.)	Cost per million Calories.
			£. s. d.
Coal,	22s. per ton,	8,300 per kilo.	6 6
Coal gas, 16 candle,	3s. 1,000,	5,555 per cu. metre,	1 0 9½
Water gas,	1s. 10d. p'r 1,000,	2,826 " " "	1 5 0
Generator gas,	1s. 10d. " "	950 " " "	3 14 2

The " generator " gas is such as may be produced by passing air over heated coke, the gas being assumed to have the theoretical composition of CO 34.3 % N 65.7 %.

Theoretically this would yield 1048 calories per cubic metre, but for the purposes of calculation it is assumed that it would yield about 950 cal. E. W.

NEWCASTLE SECTION.

On the Titration of Sulphurous Acid and its Salts. (P. 513.) G. LUNGE.

In confirmation of Thompson's results it was found that $Na_2 SO_3$ imparts a neutral tint in solution to phenolphthalein and rosolic acid, but that with litmus, phenacetolin and methyl orange the neutral point is obtained when $NaH SO_3$ is present in a solution. The color-changes with methyl orange are very sharply marked, while they are indistinct with litmus and phenacetolin.

E. W.

On the Action of Soda, Lime and Magnesia on the Salts of Ammonia and Organic Amines, and on the Titration of Aniline. (P. 514.) G. LUNGE.

Account of experiments with a view to determine which of the three—Na OH, CaO or MgO were best suited for the expulsion of ammonia by distillation in analytical operations. It was found that either might be used if an excess were employed and if the distillation were kept up for at least three hours. In distilling with an excess of ammonium chloride, CaO and NaOH liberated their full equivalent of NH_3, while MgO liberated only about 85 per cent. of its equivalent. Salts of volatile fatty or aromatic amines (ethylamine or aniline) acted in the same manner as the ammonia salts.

The acid in neutral aniline salts can be titrated with normal potash solution, using phenolphthalein as an indicator, just as if the aniline were not present. With methyl orange, however, the neutral aniline salts give a neutral reaction, and the aniline itself shows the reaction of a base. The change of color is not very sharp after 92 to 94 per cent. of the amount of acid required by theory has been added. The use of alcohol of over 25 per cent. strength for dissolving the aniline renders the color-change still slower, and with pure alcohol there is no change of color at all. In titrating with toluidin, the change of color was very slow, though with paratoluidin it was very sharp. Quinoline gives a pretty sharp change of color also,　　　　　　E. W.

BIRMINGHAM AND MIDLAND SECTION.

The Distillation of Coal and Recovery of Hydrocarbons from the Gas. (P. 515.) G. E. DAVIS.

An interesting history of the progress of gas manufacture in England is first given. In connection with the utilization of the ammonia it is noted that low temperatures on the retorts increase the yield of ammonia. The author proposes to use two towers, or in some cases three, in which the ammonia may be absorbed by sulphurous acid in the proportion suitable for the production of bisulphite under the pressure of air, and evaporating the liquor by the waste heat of the retorts, by which means ammonium sulphate is obtained.

The hydrocarbon oils (crude benzol) it is proposed to extract by passing the gas through the " yellow oil " of the tar distiller—the fraction between the creosote and anthracene oil—keeping the oil

at a temperature of about 40° F. The liquid hydrocarbons are then obtained by steaming the oil. In the author's experiments about 4¼ gallons of crude benzol were obtained from the gas from a ton of coal. The results of a fractional distillation of the product are given in detail.

It is observed that until 1876 benzol was not recognized as a constituent of coal gas.

In the discussion that followed, Prof. Tilden remarked that over twenty years ago he had seen a process, intended to demonstrate the presence of benzol in coal gas. The gas was passed through strong nitric acid, and nitro or binitro-benzine thus obtained.   E. W.

On the Oxidation of the Sulphur Compounds Occurring in the Manufacture of Caustic Soda. (P. 525.) G. Lunge and J. H. Smith.

The results of numerous laboratory experiments in the use of nitrites and nitrates are given together with equations, followed by a short criticism of the conclusions of other experimenters on the subject.

The conclusions are given as follows:

1. Under no circumstance is *nitrate* reduced directly to a lower form than that of nitrite.

2. *Nitrate* in its reduction to nitrite, is capable of oxidizing sulphide to sulphite, and sulphite to sulphate, from about 140° C.

3. *Nitrite* oxidizes sulphide to sulphite, chiefly with reduction to ammonia, at temperatures from about 200° C. At very high temperatures, exceeding 360° C, it oxidizes sulphite, chiefly with reduction to nitrogen.

4. Neither *nitrate nor nitrite* has any action whatever upon this sulphate as such, *i. e.*, before it is split up, but they oxidize the sulphite and sulphide, into which it is split up, exactly as they would the individuals under the same conditions.

5. The presence of iron, in every case, hastens but does not alter the results of the action. The following equations represent all the possible cases of the action of nitrate and nitrite on the sulphide, sulphite, and thiosulphate, both in the presence and absence of iron. About 10 per cent. may be taken as the proportion of total sulphur oxidized according to the secondary equations:

I. From 140°   with iron from 120°?

$$Na_2 S + 3KNO_3 = Na_2 SO_3 + 3KNO_2$$
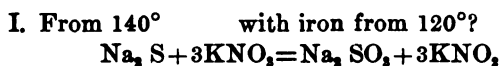
II. KNO_3 remains.

From 140°   with iron from 120°?

$Na_2 SO_3 + KNO_3 = Na_2 SO_4 + KNO_2$.
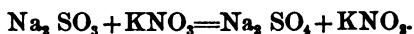
$Na_2 SO_3$ remains.   See IV.

III. $Na_2 S$ remains.

From 200°   with iron from 140°?

(a) Primary, $Na_2 S + KNO_2 + 2H_2O = Na_2 SO_3 + NH_3 + KHO$.

(b) Secondary, 10%. $Na_2 S + 2KNO_2 + H_2O = Na_2SO_3 + N_2 + 2KHO$
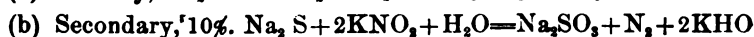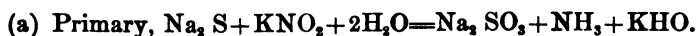
$Na_2 S$ remains; add KNO_3.   See I.

KNO_2 remains.   See IV.

IV. Neither KNO_3 nor $Na_2 S$ remains

After 360°?   With iron; before 360°.

(a) Primary, $3 Na_2 SO_3 + 2KNO_2 + H_2O = 3Na_2 SO_4 + N_2 + 2 KHO$.

(b) Secondary, (10%) $3 Na_2 SO_3 + KNO_2 + 2H_2O = 3 Na_2SO_4 + NH_3 + KHO$.
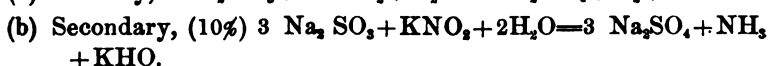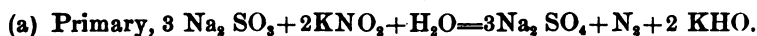
$Na_2 SO_3$ remains; add KNO_3.   See II.

E. W.

On the Cause of the Diminishing Flame in Lamps Fed with Inferior Kerosene. (P. 536.)   T. NAKAMURA.

It was observed that much of the "kerosene" imported to Japan from the United States gave a fairly good light with a fresh wick, but the light obtainable after a time diminished, and no scraping of the wick would improve it.   The investigation was undertaken to discover the cause, if possible.   A fractional distillation of three different brands of the "kerosene" showed that these kerosenes contained large proportions of heavy oils, about 75 per cent. of the samples distilling at temperatures above 200° C.; Sp. Gr. 0.70 to 0.796 ; flashing points 74 to 77° F.   The residues in the retorts yielded much paraffine and vaseline.   The fraction of the distillate coming off between 180° and 280° C was turbid, and on standing an acid, aqueous liquid separated.   The presence of water in the wick was suspected to be one of the chief causes of the loss of illuminating power of the oil.   This was proved to be the case, for on drying, the wick, it was found to give a light of the original intensity.

E. W.

London Section.

Discussion on the Desirability of Uniform Methods and Bases of Analysis, and the Practicability of Establishing an International Agreement Concerning them.   (P. 2.)

Some of the points made in this interesting discussion were as follows:

It would be objectionable to reduce chemical analysis to a purely mechanical operation.

Many chemists regard their methods of analysis as their capital, and accordingly refuse to communicate them.

Some also will refuse to follow certain prescribed methods on the ground that they are competent to judge for themselves.

A modification of a prescribed method, e. g., a little more or a little less acid, where the use of it is prescribed, may give a high or a low result.

Rules cannot be laid down to meet every case. In this connection the variable results for Manganese, in some Spanish iron ores, was quoted. The ores were found to contain Ti and Ba, which, in some cases, had been partially or ¨entirely weighed with the iron and in other cases not.

Truthful reports are not always desired by the client. In some cases the reports are known not to be truthful, but conventional, as in the case of soda, where the molecular weight of NaO (old system) was taken as 32 in 1836, and is still adhered to; the difference being about 1% in favor of the manufacturers. The Cornish copper assay, which may be in error to the extent of 2%, was also quoted. A dealer in articles, bought and sold by analysis, stated that the dealers and manufacturers adapted themselves to such conventionalities with regard to the tests, and regulated their business accordingly so that the variation between the chemists' reports and the facts, did not make so much difference as it might seem.

Sir F. Able advocated the adoption of a decimal system in commerce as a step toward uniformity in estimating the commercial value of various articles. On this point he was opposed by Sir F. Bramwell, an engineer, who claimed that the use of a decimal system made people incapable of mental arithmetic.

It was finally resolved to recommend to the General Council the appointment of a committee to determine in what cases, if any, it is desirable to obtain such international agreement. E. W.

Liverpool Section.

Results of the Examination of the Tar from Sutherland's Gas Producers. W. Smith. (P. 9.) The Sp. Gr. of the tar was 1,085.

The result of the first distillation of 2.5 litres afforded (by weight) oils 36.9%, coke 30.5%, water and loss 32.6%.

The oils were again fractioned, the fractions treated with soda and sulphuric acid, and again fractioned; in each case the distillates, which solidified on cooling, were set aside for determing paraffine. The largest yield was of oils distilling at 230°-250°, at 250°-300° and of paraffine, the latter in proportion to of 6.7 per cent. on the tar. No naphthalene was obtained. E. W.

Discussion of M. W. P. Thompson's Paper on the New Patent Law. (P. 11.)

Manchester Section.

Gas Making by Coopers' Lime Process, with Notes on a Method of Gas Analysis for use in Gas Works. J. A. Wanklyn. (P. 12.)

For testing the gas, it is proposed to use a bottle, having a capacity of one-tenth of a cubic foot, fitted with a hollow stopper in which the solution of the reagent may be placed.

The bottle is inverted, filled with the gas by displacement, the stopper inserted containing a measured amount of the reagent of known strength, e. g., lead acetate for H_2S, and the bottle is well shaken. The contents are tested for H_2S by lead paper, and the process is repeated until the lead solution is no longer blackened. From the amount of lead solution used, the amount of H_2S present may be calculated. For carbonic acid, baryta water is used in the stopper, the barium carbonate being filtered off and weighed. For ammonia, the Nessler reagent is used if the amount is small. If large, it must be estimated by alkalimetry.

The Cooper process consists in mixing 2½ parts of slaked lime with 100 of the coal, and charging this into the retorts.

The advantages claimed are: 1st, a large yield in ammonia; 2d, a slight increase in the amount of gas; 3d, a marked diminution in the amount of sulphur in the gas.

With a coal containing 1.7 per cent· sulphur, gas has been made by this process, containing 3 grains S per 100 feet, while the puri-fiers last for a very long time.

In the discussion which followed it was suggested that some kinds of coal were more suitable than others as regards mixing with the lime, or as regards the amount of ashs and sulphur in the coke. The loss of the sale of spent oxide (£4,000 for 1883 at the Manchester Corporation Works) was mentioned as an objection to the process.

As to the objectional nature of sulphur in the gas, opinions dif-fered. It was claimed by one speaker that the use of tho lime lowered the temperature of the retorts to such an extent that less gas was obtained.   E. W.

Newcastle Section— General Meeting.

International Methods of Sampling and Testing. J. Pat-tinson. (P. 17.)

A review of the points suggested at the meeting of the London Section. The author suggests that adopting certain methods of analysis would.limit original research as to methods. The estab-lishment of some sort of a court of appeal was also suggested.

In the discussion, attention was called to discrepancies in results on soda, phosphoric acid in fertilizers, tannins and acetic acid. The resolution proposed in the London Section was finally passed.
                                                    E. W.

A Review of the Present Methods of Preparing Hydro-bromic Acid, and a Description of a Process for Prepar-ing it from Bromide of Tinc. and Sulphuric Acid. A. Som-mer. (P. 20).

The methods recommended are classified as follows:

1st. Direct combination of Br and H, with the agency of heat, contact with red-hot Pt, as wire, sponge or tube, red-hot, porcelain tube or electric spark. These methods are troublesome, but are preferable where a pure, anhydrous acid is desired.

2. Decomposition of hydrogen compounds by Br, H_2S in aque-ous solution of Br, H_2S in CS_2 solution of Br, Br with paraffin at 185°C, Br with sulphites or thio-sulphates. These methods are wasteful in material. The Br is largely retained in the resi-dues.

3d. Decomposition of compounds Br with solid metalloids by the action of water,—sulphur bromide, antimony bromide, phosphorus bromide. The latter method requires considerable care to avoid explosion in forming the PBr_5. The author describes a method which he has found safe and profitable. It consists in allowing the Br to drop gradually from a stopcock funnel upon a mass of phosphorus under water, which is kept cold. The liquid is drained from the phosphorus, H_2S passed through it to separate the As (an inevitable impurity in commercial phosphorus) and the liquid is distilled. The HBr should not be allowed to come in contact with organic substances.

4th. Decomposition of metallic bromides by acids. Sulphuric, phosphoric and tartaric acids have been used. With tartaric acid there is loss of material. Phosphoric acid is costly. Sulphuric acid, with some bromides, liberates Br and SO_2 which contaminates the product, if the acid is above a certain strength. So far as $ZnBr_2$ is concerned, it has been found that any acid containing under 80 per cent. H_2SO_4 can be safely used. $BaBr_2$, made either by forming NH_4 Br and decomposing by Ba CO_3, or by the reaction of Ba S and Br distilled with H_2SO_4, gives a good product, though the process is somewhat lengthy. KBr with H_2SO_4 is expensive. The author's process is minutely described. It consists in forming a $ZnBr_2$ solution by the action of Br on metallic zinc. in presence of water, the mixture being kept cold,—evaporating the solution to dryness and heating until the edges begin to fuse. A retort is then charged in the proportions of 1 mol $ZnBr_2$, 10 mol. H_2O and 2 mol. H_2SO_4 and the acid distilled off. The distillate invariably contains H_2SO_4, and Ba Br_2 or Ba (HO_2) in sufficient amount to saturate all the H_2SO_4 must be added, and a second distillation made.   E. W.

Converting Sulphides into Sulphates by Means of Nitric and Hydrobromic Acids. (P. 23.)   A. Sommer.

After digesting with fuming nitric acid, until the acid ceases to act energetically, small portions of hydrobromic acid are added.
                                                                E. W.

Remarks on Thermochemical results. M. BERTHELOT. (P. 4). An attack on Mr. Thomsen's work on Thermochemistry.

E. W.

Researches on Nitrogen Iodide. A. GUYARD. (P. 12).

The nitrogen iodide, obtained by the action of aqueous ammonia on iodine, is decomposed by light, with effervescence of nitrogen. The violet rays have the least effect, and is greatest in the yellow rays. In pure water the action begins at first with effervescence followed by a volent explosion. In ammonia, of 22° B, it effervesces steadily without explosion. The rapidity of decomposition is proportional to the intensity of the light. The iodide forms with equal facility in light or in darkness, but in the light it forms faster than it decomposes. It is proposed to measure the intensity of light by measuring the nitrogen evolved, when iodine and ammonia of 22° B are allowed to act upon one another. Half of the iodine used always goes to form ammonium iodide. Equations, illustrating the action of formation, decomposition in the light, etc., are given.   E. W.

Researches on the Double Iodide of Copper and Nitrogen. A. GUYARD. (P. 16).

A tolerably concentrated solution of an alkaline biniodide, when added to an ammoniacal solution of copper, affords a crystalline precipitate of a violet garnet shade, consisting of a combination of NH_4I with Cu I. The compound is stable when dry or in its mother liquor, but is decomposed by water and liquid ammonia.   E. W.

Action of Iodine on Potassium Seleniocyanate. A. VERNEUIL. (P. 18).

A concentrated solution, composed of 93 parts I, 120 parts KI, and 100 parts water, when run, drop by drop, into a 10 per cent. solution of potassium seleniocyanate, clouds, turns red, and finally deposits red crystals. On analysis, these crystals were found to contain iodine, which the author believes to be due to an impurity in the state of cyanogen iodide.

The true composition is believed to be $C_6 N_3 KSe_8 2HO$. (Old system).

The substance has an unpleasant odor of both hydrocyanic acid and seleniuretted hydrogen. It is decomposed by water or by heat-

ing to 120°. Insoluble in ether, chloroform and CS_2. With absolute alcohol it decomposes, depositing selenium, and affording a brown substance soluble in alcohol, $C_4N_3KSe_6$, having the same properties of decomposability and solubility, as the first mentioned compound.   E. W.

On the Emetics of Mucic and Saccharic Acid. D. KLEIN. (P. 20).

By introducing antimonious acid into a boiling solution of sodium bimucate, a compound analogous to sodium tartar emetic is produced, the tartaric acid being replaced by mucic acid. The analysis of the compound and some of its properties are given. The acid saccharates appear to form similar compounds, but as yet no crystallizable compounds had been obtained.   E. W.

Determination of Tannin Contained in Vegetable Substances, Principally in the Bark of Oak, Birch, Fir Quebracho, Cinchona, etc. M. PERRET. (P. 22).

For this method are used: 1, a solution of egg albumen, containing 20 grms. in 100 cc. of water (unfiltered). 2. A solution containing 10 grms. dry aluminium sulphate in 100 cc. of water (unfiltered).

For the process, 20 grms. of the bark to be analyzed is extracted with water by two boilings of 15 minutes each. The liquors are united and evaporated to 100 cc. This is then cooled to 70°, and the albumen solution added little by little, so long as a precipitate forms, the solution being constantly agitated. The solution is brought to a boil, and the moment it boils the aluminium sulphate solution is added from a burette, the solution being briskly agitated. The addition of the aluminium sulphate is kept up until the precipitate becomes granular and compact and separates from the solution. It is then cooled, filtered through a weighed filter, washed with hot water and dried until it ceases to lose weight. From the weight of the filter and precipitate is deducted that of the filter, that of the albumen, and that of the aluminum sulphate. The remainder represents the tannin in the sample. The author finds, by experience, that whatever the combinations into which the sulphuric acid of the aluminum sulphate may enter, the weight of the precipitate is increased by an amount exactly equal to the weight of that of sulphuric acid, and, therefore, the entire weight of the aluminium sulphate is to be deducted.   E. W.

Session of the Society of Dec. 28th, 1883.

M. Manumené spoke of the synthetical formation of $Cu_2 S$, by pressure, and of the formation of Cu_5O_3, by heat, as confirmation of his theories advanced on the subject.

As regards the apparent variations in the atomic weight of carbon spoken of by M. Schutzenberger, the speaker attributed them to slight experimental errors.

M. Longuinine communicated results of experiments on the calorific powers of isomeric and homologous actions and others. The two isomeric acetones gave essentially the same amounts of heat, with homologous acetones the addition of each CH_2 caused an increase of about 158,000 calones. The difference in amount of heat developed by the diethylic and dimethylic ethers of carbonic acid was somewhat less than is usual between homologues.

M. Guntz had measured the heat of neutralization of alkaline and alkaline earthy hydrates by H F. The heat developed is something less than that for the chlorides.

MM. Oechsner and Essner had oxidized the beta-lutidine derivation of brucine. On treating the resulting liquid with cupric acetate a compound yielding an acid with the properties of nicotianic acid, another compound containing an acid which yielded pyridine by distillation over lime, and cupric formiate and aceto-formiate.

M. Oechsner had attempted to hydrogenize beta-lutidine, but thus far without success, in obtaining a stable hydride. He also described some of the properties of the lutidine from coal tar, which is peculiar in being soluble in water in all proportions.

M. Lemoine spoke of the hydrocarbons and higher alcohols contained in petroleum, describing octyl, nonyl and decyl hydrides and their derivatives, specimens of some of which were exhibited.

J. H. S., jr.

Experiments on the Combustion of the Diamond. C. FRIEDEL. (P. 100.)

The oxygen used was made from $KClO_3$, and carefully purified. The combustion was effected in porcelain tubes, as the Bohemian glass was found to be too fusible.

After setting up the apparatus, experiments in blank were first made. In the unsuccessful experiments with Bohemian glass tubes

it was observed that the diamonds did not coke, but presented a dull, partially corroded surface. The results were as follows :

Diamond taken.	Ash.	CO_2 obtained.	at wt C.
0.4705 gms.	0.0007 gms.	1.7208	12.017
0.8621 "	0.0005 "	3.1577	12.007

In the above Cape diamonds were used. Some magnetic and some crystalline particles were found in the ash. Some Brazil diamonds were found to contain black carbonaceous particles. **J. H. S., jr.**

Response to the Reclamation of MM. C. Vincent and Delachanal. F. SESTINI. (P. 104.)

With regard to priority in methods of preparing sulpho carbonates. **J. H. S., jr.**

On a Fraud in Tartar Emetics. J. CASTELLIAZ.(P 106.)

The potassio-antimonic oxalate is frequently offered instead of the tartrate. The former contains 23.67 per cent. antimony oxide as against 43.7 per cent. in the genuine article. The fraud may be detected by dissolving in water, adding acetic acid, and then calcium chloride solution. The oxalate gives an immediate precipitate, while the tartrate gives none. The detection of sodium phosphate, which is sometimes fraudulently added, is more difficult. **J. H. S., jr.**

On the formation of Acetylene at the expense of Iodoform. P. CAZENEUVE. (P. 106.)

Silver, mercury, copper, iron and zinc, or mixtures of them, in a fine state of division, as well as nascent hydrogen, when brought in contact with iodoform in presence of moisture, give rise to the formation of iodides and acetlylene, even in the cold, though the action is more rapid if the mixture be heated. Beside the acetylene, two other compounds are formed, the one a gas with a fœtid odor, the other a very dense liquid containing iodine, but having the odor of chloroform. **J. H. S., jr.**

Heat of Neutralization of the Alkaline and Alkaline Earth Bases by Hydrofluoric Acid. M. GUNTZ. (P. 110.)

The heat of neutralization is somewhat less than for the corresponding chlorine compounds. The list of formation of hydrofluoric acid is probably less than 32.9 cal. **J. H. S., jr.**

Note on the Observations of M. Spring. E. JANNETTAZ. (P. 114.)

The author denies first, that pressure determines crystallization, and, second, that pressure determines combination.

Schistosity, and not chrystallinity, appear to result from pressure, and the small amount of combination detected in mixtures of sulphur with various metals after subjection to pressure, is attributed to the heat developed.   J. H. S., jr.

Note on the Development of Schistocity in Compressed Bodies. ED. JANNETTAZ.

Resumé of some experiments undertaken to combat the views advanced by Mr. Spring.   J. H. S., jr.

On the Second Anhydride of Mannite. A. FANCONNIER.

The method of preparing this body is described in detail. It has the formula $C_6 H_{10} O_4$, is slightly deliquescent, and dextrorotatory. Being isomeric, with the mannide described by Berthelot, the author names it *isomannide.*

The method of preparation and elementary analyses of several derivatives are given.

Action of Cyanogen on the Toluidines. J. A. BLADIN. (P. 125.)

The preparation, salts, and some derivatives of cyanogen compounds of para and metatoluidine are described.   J. H. S., jr.

Zeitschrift f. Anal. Chem. 1884.

On the Estimation of Phenole, in Creosote Oil. BY DR. KLEINERT. (P. 1.)

The author, after collecting the oil, proceeded as follows :

1 part of the acid oil was shaken up with 30 times its weight of warm water, and placed aside to settle.

The oil not dissolved was freed from water, and submitted to fractional distillation. Up to 180° C. a few turbid drops of liquid had distilled over. The receiver was now changed. The temperature rose to 208°, and then slowly to 215°. The distillation was not continued above this, as the author only wished to know if the acid oils contained, besides phenole, any other compound of the same, or nearly the same boiling point, which would behave in contact with bromine in the same manner as carbolic acid. But as the existence of such a body is hardly to be expected, it now becomes necessary to study the properties of the other higher-boiling oils in relation to bromine.

500 g. of crude oil was submitted to fractional distillation.

At first, by low temperature, a little water passed over. The temperature then rose to 180°, and up to this point only a little oil had distilled over.

The temperature was then raised to 190°, and a small amount of oil, free from water, passed over. At 210° the oil distilled more freely. At 212°, white fumes of low tension passed over, and from 218°—222° the temperature rose very slowly.

The temperature then rose slowly to 250°, 260°, and 265°, and only a few oily drops passed over, which partially solidified in the neck of the retort and receiver to a mass of the consistency of butter.

The distillation was stopped at 270°, and the distillate placed for three days in a cool room, during which time its yellow color changed to reddish brown, and deposited a solid, yellowish body. Previously the specific gravity of the liquid at 13°, was found to 1.007.

The solid body was separated from the fluid, washed with alcohol, dissolved in petroleum ether, and allowed to evaporate slowly. Strongly lustrous crystals were obtained, which were washed with alcohol and dried. From its melting point and boiling point it was found to be naphthaline.

The dark red liquid was shaken up with 300 c. c. caustic soda solution of 1.25 Baumé, and placed aside to settle. It separated after a while in two layers. The top one, of the same color as the distillate, was clear, and amounted to 130 c. c. The lower one was brown, and amounted to 270 c. c.

After the neutral oils had been separated, the caustic soda was decomposed with muriatic acid, and the acid oils precipitated, after being freed from salt, were submitted to fractional distillation.

At 100°.   Water passed over.

At 110°.   White vapors appeared, a milky fluid passed over, and the thermometer rose slowly

to 120°.   The vapors ceased to appear at 115°, and the thermometer rose rapidly

to 170°.   Here the receiver was changed. The temperature then rose to 190°.

At 190°.   Only a little oil had passed over.

At 195°.   White vapors appeared again, and the temperature rose slowly.

At 198°.   The thermometer remained stationary for a while, and then rose very slowly to 199°, 200°, 203°, 205°, and from there it rose more rapidly to 220°.

At 230°.   A dark yellow oil began to pass over.

At 240°, 250°.   Only a few drops passed over.

At 260°.   Only a very little distilled over.

At 265°.   The retort became filled with yellow fumes, and as only a small residue was left in the retort, the distillation was stopped.

All that had distilled up to 170 was allowed to rest, and separated

into two layers, the lower one being oily, while the upper one was watery.

The oil was examined for carbolic acid, as follows :
(a) With piece of pine wood ; turned light blue.
(b) With chloride of lime solution ; weak reaction.
(c) With ferric chloride ; violet-colored solution.
(d) With bromine water ; slight turbidity.

The distillate of the acid oils, which had been distilled from 170°—265°, was redistilled. The following fractions separated, and as before, were tested for carbolic acid:

170°—200°   (a)   Light blue coloration.
            (b)   Plainly visible blue solution.
            (c)   Violet solution, changing color.
            (d)   Turbidity and precipitation.
200°—220°   (a)   Yellow, with blue coloration above wetted surface.
            (b)   Light bluish solution.
            (c)   Violet solution, soon decomposing.
            (d)   A much more pronounced white precipitate.
220°—230°   (a)   Slightly blue above wetted surface.
            (b)   On adding ammonia, white precipitate soluble in water, and giving a yellow solution with chloride of lime.
            (c)   Violet solution.
            (d)   Heavy white precipitate.

In all the three portions, sub. a, b, c, the presence of phenole is verified.

The neutral oils which separated from the distillate, after treating with caustic soda solution, were likewise submitted to fractional distillation.

At 110° a few drops passed over, the temperature then rose to 150°, and the liquid began to boil, after which the temperature rose rapidly to 170°, 180°, 190°, and a large amount of oil distilled over. At 200° the receiver was changed. From 208° the temperature rose slowly to 215°, remained stationery for a short time, and finally rose to 250°. The distillation was stopped here, and the two fractions were treated, (a) with chloride of lime, (b) with ferric chloride, (c) with bromine water.

I.   150—200°   (a)   Below blue and above red.
      (5 c. c.)   (b)   . . . .
                  (c)   Turbidity.
II.   200—250°   (a)   Bluish, above orange.
      (75 c. c.)   (b)   . . . .
                  (c)   Turbidity.
III. 200—250°   (39 c. c.)
                  (a)   Below reddish, above slightly blue.
                  (b)   On adding ammonia, reddish solution. On adding chloride of lime, greenish, then yellow, and at last loss of color.

IV. 250°—290° (7 c. c.)

(c.)   Violet, soon losing color.
(d)   Heavy white precipitate.

(a)   Yellowish.
(b)   Ammonia added to dilute solution produced a reddish color.
(d)   Much heavier white precipitate.

The author, after numerous other experiments, came to the following conclusions:

(1) All distillations furnish between 150° and 200°, the smallest distilates.

(2) It is not to be surmised that in liquids distilling at a temperature of 200° we should meet with carbolic acid, as the latter boils at 184°—185°, but strange to say, the fractions obtained between 200°—250° are really the richest in carbolic acid.

(3) The acid oils contain bodies boiling above 250° which behave like phenole in contact with bromine.

If, therefore, we estimate the phenole in a sample of creosote oil, according to Koppeschaar's method, we do not get the largest yield from the phenole itself, but from other bodies contained in the oil, which are soluble in water, and have higher boiling points.

J. H. S., Jr.

A few remarks on the practicability of Schlösing's Ammonia-Estimation Process for Plant Extracts. By E. Shulze. (P. 13.)

The author states that the presence of glutamine and asparagine materially affects the correctness of Schlösing's method, but that with proper precautions, the method may be employed.

Thus, if it is desired to make an ammonia estimation of a plant extract containing asparagine, and we change the standard acid, standing over the extract after a period of 48 hours, and titrate back, the error will be only a small one, even if a considerable amount of asparagine be present.

Suppose, for example, that the substance under examination should contain 0.20 per cent. N, in form of ammonia, and 10 per cent. of asparagine, we would probably find 0.22 per cent. nitrogen, as ammonia, provided the asparagine in the extract does not undergo a heavier decomposition than in pure solutions.

After various other remarks on this subject, the author concludes that, with proper care, the ammonia in extracts containing asparagine may be nearly all absorbed by the standard acid after the lapse of about 48 hours.   J. H. S., Jr.

On the Estimation of Organic Matter, According to Methods Depending on the Reduction of Potassium Permanganate. By Dr. A. R. Leeds. (P. 17.)

The author found, after numerous experiments, that the methods

of Forchhammer, Kubel-Tiemann, and Schulze-Trommsdorff, are
liable to error, and that it was better to operate at nearly a boiling
temperature, which he obtained by placing the flask containing
the water in a water-bath which heated contents to 99° C. The
heating was maintained for ten minutes.

He also found that the results thus obtained agree with those de-
pending on the reduction of silver nitrate to metallic silver in the
presence of organic matter.   J. H. S., Jr.

On a Method for the Precipitation and Quantitative Estimation of Digitaline, Digitaleine, and Digitine. By R. Palm. (P. 22.)

The author proceeds as follows :

The coarsely powdered herb is thoroughly extracted with water,
and the extract filtered through bone black till nearly colorless, and
the filtrate treated with lead acetate till complete precipitation
ensues. The precipitate is collected on a filter, and the filtrate is
treated with lead acetate and alcoholic ammonia, (12 parts lead
acetate and one part Liquor Dzondii), till no further precipitation
occurs. This last precipitate is composed of lead oxide and the
glucoside of digitalis. After washing, it is collected on a filter and
rubbed up with water to the consistency of a thin paste. It is then
decomposed by treating with sulphuretted hydrogen. The pre-
cipitate is collected on a filter. The aqueous filtrate contains all
the digitaleine, while digitaline and digitine remain on the filter
with the lead sulphide. By treating the lead precipitate with chlo-
roform, and evaporating the extract, digitaline may be obtained in
a crystalline form. Lastly, by extracting the lead precipitate with
alcohol, and evaporating the latter, digitine is left behind in a pure
condition.

The property of digitaline, to be precipitated with lead acetate
and alcoholic ammonia, is of great use in detecting it in poisoning
cases, as the process is applicable to even very small quantities, it
being completely precipitated.

In poisoning cases, the lead precipitates of these three poisonous
glucosides may at once be distinguished from one another by the
following reactions :

1. The precipitate of picrotoxine is more slimy, and turns saffron-
yellow when treated with strong sulphuric acid.

2. The precipitate of digitaline is gelatinous, and turns flesh col-
ored when treated with sulphuric acid.

3. The lead precipitate of solanine is sandy, and turns dark fawn
color when treated with sulphuric acid. By adding to the mixture
a little sugar it turns first violet, and then blue.   J. H. S., Jr.

On a Few Physical Properties of Chemical Compounds.

F. NIEMÖLLER. (P. 1.)

The author finds that the refracting index n, and the gravity d, of all gases, change with the atmospheric pressure and temperature, in such a manner, that the quotient $B = \frac{n-1}{d}$ remains constant.

This quotient, which he calls the " specific refracting property " of the substance, depends solely upon the chemical nature of the gas.

Accurate experiments on a series of liquid bodies, also proved that the quotient B, stands likewise in relation with pressure and temperature. Thus Landolt observed that, in ethyl alcohol B, at 12° C, has the value 0.4426, while at 28° C it has the value 0.4423. He is, therefore, lead to believe that B, in liquid chemical compounds, depends principally upon their constitution.

Numerous experiments lead to the following laws :

(1.) " Isomeric substances have the same specific refracting indices."

(2.) " That physical mixtures have the same indices as chemical compounds of the the same percentage composition."

(3.) " That the molecular structure is without influence on the size of the molecular refraction."

" The molecular refraction of a molecule is the sum of the atomic refractions of the molecule. Each atom exercises, in each molecule, a similar influence."

J. H. S., Jr.

Formulæ, to estimate the proportion in which two solutions of known per centage should be mixed, in order to obtain another solution of the desired per centage. BY R. RIETH. (P. 54.)

As an example, the author gives the following figures :

Suppose, that 2grm. hydrochloric acid require for neutralization 12.5 c.c. normal, KOH solution, and that another 2grm. of a different acid, should require 16.8 c.c. The relation between them may be expressed as follows :

TOO DILUTE.	REQUIRED STRENGTH.	TOO CONCENT.
12.5	13.7	16.8

DIF. 1.2   DIF. 3.1

Now as it is necessary to take more of the third, the weaker the first ; or more of the first, the stronger the third, 3.1 dilute acid + 1.2 pts. concentrated acid must be taken in order to obtain 4.3 pts. acid of the desired strength.

These proportions are best calculated to an even number, or say, 1,000 c.c.

We therefore get the following equation :

$$4.3 : 3.1 = 1,000 : x$$
$$x = 720.93 \text{ cc. dilute acid.}$$

According to the same rule ; the amonnt of concentrated acid is 279.07 c.c. By mixing the two acids, 1 lit. acid of the required strength (25%) is obtained.

J. H. S., JR.

Journal of the London Chemical Society.

On the Estimation of Starch. C. O'Sullivan. No. CCLIV. (P. 1.)

The process, as applied to the cereals, involves the treatment of the flour with ether to remove fat, with alcohol of .90 specific gravity, to remove sugars, albuminoids other than casein, etc., and with water at 35°–38° C to remove amylans, etc. These solvents are without action on starch.

Purified starch is then converted by specially prepared diastase into maltose and dextrin, which are the sole products, and the residue after this action of diastase is shown to be free from starch. Maltose and dextrin are then determined in the solution by the saccharimeter. Malted grains yield maltose to the alcoholic extract among the other sugars, but dextrin is not present in either alcoholic or aqueous extract. Raw grains, of *average ripeness*, yield neither soluble starch nor either of its decomposition-products to the aqueous solution. The errors of the process lie within 0.5 %

A. A. B.

On the Oxidation of Phosphorus at a Low Temperature and the alleged Decomposition of Phosphorous Anhydride by Sunlight. R. Cowper and V. B. Lewes. No. CCLIV. (P. 10.)

Detailing the results obtained by passing of air over fused phosphorus and the exposure of the product to sunlight. The deposit

obtained in the tube is shown to be a mixture of phosphoric and phosphorous anhydrides with pure phosphorus in crystals, the latter becoming amorphous phosphorus when exposed to sunlight.

<div align="right">A. A. B.</div>

On the Constitution of the Fulminates.   E. DIVERS and H. KAWAKITA.   No. CCLIV.   (P. 13.)

The authors, acting on Steiner's recommendation of mercury fulminate as a source of pure hydroxylammonium chloride for which one of them had need, were led into an investigation of the fulminates.   Fuming hydrochloric acid, acting on dry fulminate, yields almost the theoretical proportion of hydroxylamine, accompanied by formic acid into which all carbon of the fulminates is converted.   *Dilute* acid yields also a trace of HCN.   No oxalic acid results from action of acids upon fulminates, although carbonic acid is set free when sulphuric acid is used.

<div align="right">A. A. B.</div>

Theory of the Constitution of the Fulminates.   E. DIVERS   No. CCLIV.   (P. 19.)

The fulminates being known to contain two isonitrosyl radicals or their equivalents, and two formic carbons, the author discusses the earlier formulæ given by Berzelius, Kekulé, Armstrong, and Steiner and advances the hypothesis that the fulminates are formed (1) from an alcoholic residue in which hydrogen has been replaced by a metal, and which retains only C and O, and (2) a condensed hydroxylamine residue.   After discussing the formula of hydroxylamine which is regarded as *amidogen oxide* $(NH_2)_2$ O the author deduces the following formulæ :

<div align="center">

Mercury fulminate,

$$\text{Hg,}\begin{array}{c} OC = N \\ \diagup \qquad \diagdown \\ \qquad \qquad O \\ \diagdown \qquad \diagup \\ C = N \end{array}$$

Fulminic acid

$$H.\begin{array}{c} OC = N \diagdown \\ \qquad \qquad O \\ HC = N \diagup \end{array}$$

</div>
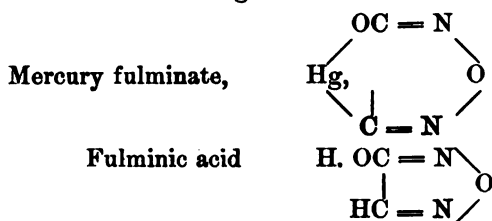
The latter is formed by the reaction.

<div align="center">

$$\begin{array}{c} H.OCH_2 \\ HCH_2 \end{array} + \begin{array}{c} ON \diagdown \\ O \\ ON \diagup \end{array} = \begin{array}{c} H.OC = N \diagdown \\ \qquad O \\ HC = N \diagup \end{array} + 2 H_2O$$

</div>
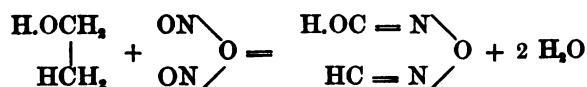
Nitrate of silver or mercury is necessary to fix the spontaneously decomposable fulminic acid as it is formed.   A. A. B.

Note on the Formation and on the Constitution of the Fulminates. H. E. ARMSTRONG. No. CCLIV. (P. 25.)

A criticism upon the last paper. Nitrous *acid*, not nitrous *anhydride*, is concerned in the reaction. The assumption of Divers that the CH_3 group exchanges 2 H for N.OH is unwarranted. The alcohol in formation of fulminic acid undergoes successive *hydroxylation*, in accordance with a known reaction, and *hydroxethaldehydrol*, CH_2 (OH), CH (OH)$_2$, is formed. This compound the author regards as the primary source of the fulminate, "*which is formed from it by simultaneous, or it may be consecutive, action of nitrous acid and hydroxylamine.*

Fulminic acid is written
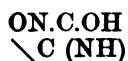
$$\begin{matrix} ON.C.OH \\ \diagdown C\ (NH) \end{matrix}$$
        A. A. B.

On Liebig's Production of Fulminating Silver without the use of Nitric Acid. E. DIVERS and M. KAWAKITA. No. CCLIV. (P. 27.)

The statement of Liebig (*Ann. Pharm.* 5, 287) that fulminating silver separates when nitrous acid is passed into an alcoholic solution of silver nitrate is incorrect. The needle-like crystals described by Liebig, were found to be silver nitrate. Neither under the conditions described, nor by the use of *silver nitrite*, could the fulminate be obtained. The essential condition seems to be a vigorous oxidation of alcohol by nitric acid in presence of either mercury or silver nitrate.

Attempts were made to obtain copper fulminate but without success. The result is ascribed to "the active catalytic oxidizing power of cupric salts, which affects the action of nitric acid upon copper (Acworth and Armstrong) and so readily causes the destruction of hydroxylamine (or isonitrosyl hydride) is sufficient to explain the failure."   A. A. B.

The Illuminating Power of Ethylene when burnt with Non-Luminous, Combustible Gases. PERCY F. FRANKLAND. No. CCLIV. (P. 30).

The author refers to the similar investigation of Frankland and Thorne, relating to the luminosity of benzol (Chem. Soc. J. 33, 89). His results are summarized as follows.

1. That pure ethylene, when burnt at the rate of 5 cubic feet per hour from a Referee's argand burner, emits a light of 68.5 standard candles.

2. That the illuminating power of equal volumes of mixtures of ethylene with either hydrogen, carbonic oxide or marsh gas, is less than that of pure ethylene.

3. That when the proportion of ethylene in such mixtures is above 60 per cent. the illuminating power of the mixture is but slightly affected by the nature of the diluent. When, on the other hand, the proportion of ethylene in such mixtures is low, the illuminating power of the mixture is considerably the highest when marsh gas is the diluent, and the lowest when the ethylene is mixed with carbonic oxide.

4. That if 5 cubic feet of ethylene be uniformly consumed, irrespectively of the composition of the mixture, the calculated illuminating power is in every case equal to or actually greater than that of pure ethylene, until a certain degree of dilution is attained. This intrinsic luminosity of ethylene remains almost constant when the latter is diluted with carbonic oxide, until the ethylene forms only forty per cent. of the mixture after which it rapidly diminishes to zero, when the ethylene forms only 20 per cent. of the mixture. When the ethylene is diluted with hydrogen, its intrinsic luminosity rises to 81 candles when the ethylene constitutes 30 per cent. of the mixture, after which it rapidly falls to zero when the ethylene amounts to only 10 per cent. In the case of mixtures of ethylene and marsh gas, the intrinsic luminosity of the former is augmented with increasing rapidity as the proportion of marsh gas rises, the intrinsic luminosity of ethylene, in a mixture containing 10 per cent. of the latter, being between 170 and 180 candles.

A. A. B.

Chemical News. Vol. 49.

Notes on the separation of Selenium and Tellurium from each other and their preparation from Lead-chamber deposit. MASACHIKA SHIMOSÉ. P. 26.

On the Determination of the Number of Atoms in a Molecule. C. A. SEYLER. P. 31.

For determination of molecular weight where the method by vapor density is inapplicable and in bodies comparatively free from crystalline structure, which tends to produce abnormal changes

of volume in solidifying, the following rule is given: "The diff
ence between the real density just before and just after fusion,
vided by the experimental latent heat gives the number of ato
in the molecule."

"Real density" is defined as a value depending upon intermol
cular distance and is obtained by dividing the relative weig
(Sp. gr.) referred to hydrogen, by the molecular weight of the bod
or where this is unknown by the atomic weight, assuming that th
molecule in this case has but one atom. Latent heat of fusion o
mercury, calculated as above, is 2.7; the experimental value of Per
son is 2.8.

The author concludes that "real density" is proportionate to
absolute temperature and suggests that the density of liquids at
their boiling points should be proportionate to latent heat of con-
densation.   A. A. B.

The Molecular Volume of Salt Solutions. W. W. J- Nicol. P. 37.

Attempts to establish a connection between the composition of a
salt and its molecular volume, analogous to the law of Kopp for
organic liquids, have been but partially succesful. The state of
molecular aggregation and the magnitude of intermolecular spaces
are comparable only in salts which are strictly isomorphous. When
salts are dissolved in water, however, the molecular interspaces are
approximately coextensive. The author considers this conclusion,
reached in a former paper, to be now established by recent work
of Groshaus (*Wiedermann's Ann.* Nov., 1883) and Bender (*Ib.*
Dec., 1883) and announces the following law : "In diluted solu-
tions (1 equivalent to 200 H_2O) the volume of a metal in a salt is
independent of the salt-radical with which it may be combined"
and *vice versa.* He finds by experiment that the volume-change
on double decomposition attended by precipitation is constant in
reactions between $BaCl_2$ or $Ba(NO_3)_2$ and Na_2SO_4 or K_2SO_4 and
hopes, by a continuation of his experiments, to be able to recognize
water of constitution of a salt in solution.   A. A. B.

Determination of the At. wt. of Oxygen. T. Hilditch. P. 37.

Discusses the methods of preparing hydrogen in which have been
used in determinations of the At. wt. of O by the CuO process, and
the subsequent manipulation, indicating possible errors.
                                                          A. A. B.

On the use of Litmus, Rosolic Acid, Methyl-orange, Phenacetolin and Phenolphthalein as Indicators. R. T. THOMSON.• P. 32 and p. 38.

Continuation of previous experiments. A comprehensive summary of the work is given in a table showing the behavior of these indicators in titration of a great variety of compounds.

Estimation of Cl. Br. and I. in presence of one another. F. MAXWELL-LYTE. P. 55.

All of the halogens are precipitated as silver salts, weighed, dissolved in very dilute solution of KCN treated with a weight of KBr equal to that of the precipitate, and then with excess of delute H_2SO_4. The precipitate is collected and weighed, dissolved again and treated as before, using one and a quarter times its weight of KI instead of KBr, dried and weighed again. The second precipitate contains all silver as bromide except what was bromide or iodide already, and the third all silver as iodide except what had previously been iodide.   A. A. B.

Rapid Filtration. B. F. DAVENPORT. P. 57.

In a note to the Editor the author describes an apparatus for pressure-filtration, in which the funnel is covered by a thick sheet of rubber weighted down by a heavy plate of glass. The filter is supported by a perforated cone, as usual, and pressure upon the surface of the liquid is supplied by a Fletcher's foot-blower, which forces air into an opening made through both plates.   A. A. B.

American Patents.

CONDENSED FROM THE OFFICIAL GAZETTE OF THE U. S. PATENT OFFICE, BY O. H. KRAUSE.

January 1, 1884.

291,142.—Base for paints.—A. E. Brockett.

Made of pine tar or Stocklolm tar, caoutchouc gum, gutta percha, gum shellac, gum copal or copal (oil) varnish, and linseed oil.

291,163.—Manufacture of ferrocyanides.—G. de Vigne.

Coal gas, or other gas or smoke, containing cyanogen or hydrocyanic acid is deprived of its tarry products and subjected to the action of a mixture of iron, in any of its various forms, and an alkaline salt.

291,167.—Process of purifying water for boiler use.—C. B. Dudley.

Consists in treating the water with caustic baryta, in addition to soda lime, the whole process being in one operation.

291,168.—Method of purifying water for boiler use.—C. B. Dudley.

Consists in treating the water, first with caustic baryta, and then with carbonate of soda, the whole process being in one operation.

291,175.—Extracting naphtha from oil.—I. W. Evans.

Heats the oil to the desired temperature, then admits live steam to drive off the naphtha in the form of vapor.

291,264.—Process of obtaining ammonia from furnace gases.—J. and J. Addie.

Consists in first fixing the ammonia in such gases after they leave the furnace by mixing them with sulphurous acid or sulphuric acid, in the form of gas or vapor, and then condensing or dissolving the salts or compounds thereby formed.

291,298.—Retort deoxidizing furnace.—I. D. Condit, Jr.

Not intelligible without the drawing.

291,302.—Preparation of glue stock from bones, etc.—E. F. Crusé.

Adds calcium carbonate to the mother-liquid resulting from the treatment of bones, etc., with hydrochloric acid in the manufacture of glue, then adds calcium hydrate to precipitate organic matter and separates the clear calcium chloride from the precipitated impurities. The calcium chloride is then decomposed by means of sulphuric acid and the resulting hydrochloric acid used over again after the calcium sulphate has been filtered off.

291,329.—Manufacture of Soap.—W. E. Gibbs and C. G. Otis.

The mixture of alkali and fat is passed forcibly through a heated channel filled with small particles of iron or other substance.

291,386.—Gas furnace for metallurgic and other purposes, and method of perating the same.—J. F. Morgan and H. F. Hayden.

The method for controlling and varying the character of the flame in metallurgic and like furnaces, which consists in first bringing together the proper volumes of air and gas to produce complete combustion at the point of initial combustion, and then surcharging the flame with oxidizing or carburizing gases between the point of initial combustion and the working chamber of the furnace.

291,410.—Blast furnace for zinc ores.—A. M. G. Sébillot.

A blast furnace combined with an upper and lower outlet-pipe, of which the former is connected with a condensing chamber, and the latter is connected with a condenser formed of pipes and a metal collecting chamber, which pipe condenser is connected with a condensing chamber.

291,417.—Process and apparatus for making coal gas.—A. Stamm.

The tarry vapors given off from fresh charges of bituminous coal in gas retorts, during the early part of the distillation, are converted into a fixed gas, by injecting such vapors by the combined action of a jet of gas under pressure, and a small jet of steam, into and through a mass of incandescent coke contained in a separate retort.

291,421.—Process of and apparatus for manufacturing gas.—J. L. Stewart.

Consists in generating a mixture of hydrogen and carbonic oxide, by decomposing steam in contact with incandescent fuel, cooling them and then forcing them by a pump into an injecting device, and thereby spraying a stream of hydrocarbon liquid into a heated vaporiser, and finally combining and fixing the resulting vapor and gases by passing them through heated retorts.

291,422.—Coke oven.—H. Stier.

A coke oven adapted for heating with gas, and arranged on the regenerative principle.

291,462.—Fume condensing attachment for ore furnaces.—E. M. Alderman.

The smoke stack of an ore furnace or smelter is connected with a large horizontal pipe, into which water can be sprayed for the purpose of condensing the fumes.

291,463.—Electric gas generator. C. E. Ball and C. S. Bradford, Jr.

Consists in generating hydrocarbon gas in an electrical generator, and hydrogen gas in another electrical generator and mingling said gases.

January 8, 1884.

291,565.—Process of making syrup and sugar from sorghum cane. A. J. Adamson.

Proposes to first roast the cane and then to express the juice.

291,641.—Process of obtaining aluminium. F. J. Seymour.

Claims to obtain an alloy of zinc and aluminium by mixing aluminous ore or earth with an ore of zinc and with carbonaceous material and a flux and subjecting the mixture to heat in a close-retort.

291,682.—Method of and apparatus for refrigerating paraffine and other oils. B. F. Shakespeare.

Consists in bringing together the oil and a refrigerating liquid both in a spray or comminuted condition.

291,670.—Process of and apparatus for obtaining gold and silver from their ores by combined electrolytic and amalgamating processes.   M. Body.

Subjects gold and silver ores to the action of ferric salts, in combination with the electrolytic process and subsequently amalgamates the metals with mercury under the continued action of the electric current.

291,676.—Apparatus for carbureting air.   W. F. Burrows.

A combination of mechanical arrangements for effecting the above purpose.

291,677.—Paint.   A. Buzolich and T. K. Smith.

Composed of the following harmonious ingredients: Linseed or nut oil, hydrochloric acid, phosphoric acid, shellac, resin, chromate of potash, beeswax and garlic.

291,678.—Paint.   A. Buzolich.

A paint composition, the basis whereof is linseed, or nut oil, combined with chrysophanic acid, sulphates of zinc and copper, and chromate of potash.

291,784.—Artificial stone.   W. Howell.

Muriatic acid, flowers of sulphur, molasses, iron scale, sand and cement.

291,784.—Tawing hides and skins.   A. Schultz.

Consists in subjecting them to the action of a solution of potassium bichromate and then treating the same with a compound containing hydrosulphurous acid.

291,785.—Tawing hides and skins.—A. Schultz.

Consists in subjecting them to the action of a bath prepared from a metallic salt—such as potassium bichromate—and then to the action of a bath capable of evolving sulphurous acid.

291,821.—Process of concentrating sulphuric acid.—M. A. Walsh.

Concentrates in the usual way until the acid contains about 93% of monohydrated acid, and then completes the concentration in iron or steel vessels.

291,830.—Hydrocarbon furnace.—R. B. Avery.

Fed by hydrocarbon vapors and gas evolved from the oil by means of superheated steam.

January 15, 1884.

291,860.—Apparatus for the manufacture and delivery of illuminating gas. —W. H. Adams.

Manufactures carbonic oxide with or without the addition of steam and hydrocarbons, by forcing a controllable supply of air to the producers and thence to the service mains.

291,948.—Gas generator.—D. M. Small.

Apparatus for enriching air or combustible gases with hydrocarbons.

291,953.—Depilating hides and skins.—A. H. Stone.

Sulphide of sodium in combination with pure sulphur and carbon.

291,993.—Apparatus for recovering soda used in manufacture of paper pulp.—E. W. Dixon.

Relates to an apparatus for concentrating dilute solutions.

292,020 and 292,021.—Mode of utilizing discarded rubber belting and rubber hose.—F. A. Magowan.

292,054.—Apparatus for making sulphuric acid.—J. S. Rigby.

The combination of the kiln or burner, the nitre oven, its pans, a sulphuric acid heating cistern, a vessel provided with an indicator and serving to contain nitrate of soda in solution and pipes for supplying the solution and sulphuric acid to the pans.

292,078.—Glover's tower. M. A. Walsh.

Claim 8. A Glover's tower, the walls and arch of which are composed of courses of cut quartz, said arch being corbeled out by overhanging arches, and formed with openings for the descent of acid from an upper chamber and the ascent of gases admitted through a lateral opening near the base of the tower, substantially as shown and described.

292,081 and 292,082.—Apparatus for making gas.—A. Wilson.

A gas producer with central rotating tuyere, liquid seal and provided with means for automatically removing incombustible refuse.

292,100.—Process of and apparatus for mixing and cooling sugar.—M. C. Cogswell.

A combination of mechanical arrangements for finely dividing the sugar and bringing it into contact with air.

292,119.—Process of making white lead.—I. K. Kessler.

Electrolyses an alkaline acetate in solution, using lead for both the anode and cathode, whereby acetate of lead and solution of caustic alkali is formed. These are subsequently mixed, forming hydrated oxide of lead and regenerating the alkaline acetate. By passing carbonic acid gas into this solution, the suspended oxide is converted into carbonate.

292,125.—Manufacture of vinegar.—V. Michaelis.

Describes a method for conducting the ordinary process of acetification with greater rapidity.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Regular Meeting, March 7th, 1884.

Vice-President Prof. A. R. LEEDS in the chair.

The minutes of the February meeting were read and approved.

The minutes of the meeting of the Board of Directors, held February 12, were read.

It was moved by Mr. Casamajor, and seconded by Mr. Stebbins, that the vote be taken on the proposed amendment to Article VIII. of the Constitution, viz.: "That 10 members shall constitute a quorum."

The amendment was carried unanimously, twenty-three members voting.

The chairman exhibited the Hoffman medal, presented to the Society by the subscribers.

The following nominations were then taken up, Messrs. Rau and Rupp acting as tellers:

	Nominated by
Dr. Antonio de Gordon y Acosto, of Havana, Cuba; care of Dr. J. J. Lewis, 42 Broadway, New York.	James H. Stebbins, Jr., Wm. Rupp, A. A. Breneman.
Harry S. Hass, Ph.B., 49 West 39th St., New York City.	C. E. Munsell, J. B. Mackintosh, Wm. Rupp.
Charles Tennant Lee, 45 Kilby St., Boston, Mass.	N. H. Darton, A. A. Breneman, T. S. Gladding.
Baron Ferdinand Van Mueller, Melbourne, Australia.	N. H. Darton, A. C. Hale, A. R. Leeds.
T. Lambert, Walpole Dye and Chemical Co., Walpole, Mass.	A. Pennisat, W. H. Nichols, T. O'Connor Sloane.
Frederick T. Walsh, Walpole Dye and Chemical Co., Walpole, Mass.	A. Pennisat, W. H. Nichols, T. O'Connor Sloane.
J. Howard Wainwright, Ph.B., 402 Washington St., New York City.	Wm. Rupp, James H. Stebbins, Jr., C. E. Munsell.
Dr. James Lewis Howe, Military Academy, Cleveland, Ohio.	T. P. Venable, James H. Stebbins, Jr., Wm. Rupp.
Vincent M. Picabia, cor. Horatio & West Sts., New York City.	P. Casamajor, James H. Stebbins, Jr., H. Endemann.
Max Schwarz, cor. Worth Street & Bowery, New York City.	H. Endemann, P. Casamajor, M. Alsberg.

All were unanimously elected.

The following were proposed for membership:

Morton Liebschütz, 345 West 34th St., N. Y. } P. Casamajor, J. H. Stebbins, Jr., William Rupp.

Edmund Banjard, 2 West 14th St., N. Y. }

The following paper was then read:

The Physical and Chemical Analysis of Flour, by A. R. Leeds.

Prof. Breneman moved that a Committee of three be appointed by the chair to decide upon a uniform system of notation and nomenclature, to be used in all publications of the Society. Amended by Mr. Stebbins, increasing the Committee to five, and carried.

Mr. Casamajor moved that an election be held to fill the position of Vice-President, and Director left vacant by the resignation of Dr. Doremus. Carried. Prof. Breneman was elected.

The meeting then adjourned.

C. E. MUNSELL,
Recording Secretary.

PAPERS UPON INDUSTRIAL CHEMISTRY.

By Albert R. Leeds.

II. THE PHYSICAL AND CHEMICAL ANALYSIS OF FLOUR.

The great attention paid during five years past in the United States to the subject of the adulteration of foods, has already resulted in a voluminous literature. Unfortunately, much of this literature is crude and erroneous, and especially that referring to the topic of the present article. Originally appearing with specious pretenses of scientific merit in certain medical journals, these misstatements have gained credence with many reputable medical practitioners. Finally, having permeated downward into the columns of the daily press and into the popular mind, they have become so firmly lodged as to make their eradication difficult.

Foremost in this direction was a paper published in Gaillard's *Medical Journal*, Jan. 1882, with the following alarming title : " Highly important and extensively advertised cereal foods under the microscope. The genuine ; the spurious ; the worthless and the fraudulent. Therapeutic as well as dietetic facts of great value to physicians and their patients. By Ephraim Cutter, A.M., M.D., Harvard, etc." The only means of research employed by the author of this paper was the microscope, which he styles an " unerring teacher," " an infallable detector of fraudulent claims in regard to cereal foods," etc. The results of microscopic examinations are termed analyses, and as such are expressed in *figures denoting the relative percentages of gluten and starch*. The principal feature of the article, and the one most calculated to awe and convince the popular mind, was the woodcuts with which it was profusely illustrated, and which purported to be impartial representations of what might be seen of these foods when looked at through an objective, magnifying 800 diameters. Some of these cuts or slides represent flour entirely made up of unruptured gluten cells, while specimens of other flour, quite as remarkable, but for a different reason, are represented as composed of starch cells and fibrous tissue only. The two flours which are more especially singled out, the one for unstinted praise, the other for condemnation, are the Franklin Mills Entire Wheat Flour, and the Gluten Flour of the New York Health Food Co. Besides the woodcuts which represent the former as composed almost entirely of gluten cells, the excellence of the former flour incites the microscopist to add that,

"So long as the makers maintain such a proportion of gluten cells, they confer a blessing on mankind." On the other hand, the gluten flour is stigmatized as "a meal and not a flour. The circulars are travesties, and show an ignorance which, if it did not affect human life, would be ridiculous." In all this so-called gluten flour which the microscopist examined, he states that in repeated examinations only seventy gluten cells were found.

Chemical analyses show the falsity of these statements, as I will explain later on. But even without the aid of positive knowledge, founded on analytical data, these statements should have deceived no one accustomed to the use of the microscope, as is evident from the following considerations. In the first place, in making a chemical analysis of flour as much as ten grammes should be used. The analysis of so large a quantity affords a guarantee that the figures obtained represent the average composition of a mechanical mixture of the constituents of a non-homogeneous product like flour. But the weight of flour exhibited on a microscopic slide does not exceed the $\frac{1}{100000}$th part of the quantity taken for chemical analysis, and could not fairly represent an average. Neither can one determine by counting upon one slide or upon a hundred slides, the relative number of starch cells and *unruptured* gluten cells, what is the percentage of starch and gluten. It could not be done even were the gluten cells unruptured. But in the process of grinding they are largely broken and their contents commingled with the starch. When so commingled, it is difficult even with the aid of chemical reagents to discriminate between the albuminoid and amyloid constituents of flour. To estimate their percentage amounts by counting is impossible.

So different in appearance are the various parts of one slide, and so different are various slides prepared from one and the same flour, that the use of pictures of such slides to substantiate statements as to differences in composition in the flours examined, is misleading. Lest any microscopist should regard this protest as unnecessary, since it is but insisting upon a matter with which he is already familiar, let him call to mind how successfully the public is deceived by the claim that microscopic research necessarily implies research of great scientific exactitude. In the present instance certainly, authorities in medical science were led astray. Had they but reflected for a moment, that Dr. Cutter's assertion that many of the cereal foods examined contained no gluten whatsoever, was in itself a sufficient

proof of the falsity of his statements, insomuch that there is no flour but what necessarily contains some gluten, they would not have indorsed his publications without independent examinations. But in an address delivered before the New York Medical Society, Feb. 8th, 1882, its President, Dr. A. Jacobi, says of these microscopic examinations of Dr. Cutter : " I shall refer to his statements, desiring to give them the greatest possible publicity. I wish the brief article of his would be distributed in a hundred thousand copies, reprinted in every secular paper, read from every platform and pulpit of the land. For it is time that fraud should be stopped, and a nefarious trade suppressed."

Then follows a résumé of Dr. Cutter's labors, in which without any assurance on the part of the presiding officer of a distinguished medical society, that he has submitted statements involving the reputation and business fortunes of more than two-score of the manufacturers of cereal foods in the United States to any independent critical research, he bestows indiscriminate and exaggerated commendation upon them all.

In a paper published in the Transactions of the College of Physicians of Philadelphia, III. series, VI., 377, I have given the results of the examinations of many of the foods referred to, the examinations being conducted with the aid of the microscope and mechanical manipulations, but controlled by chemical analysis. Without quoting in detail, I shall insert in this place only the table of analyses as showing how incorrect was the statement made by Dr. Cutter and approved by Dr. Jacobi, of the absence of gluten in Blair's Wheat Food, " Imperial Granum, Ridge's Food, Savory & Moore's Food, Farwell & Rhine's Gluten Flour, Hubbell's Prepared Wheat," and other cereal preparations.

ANALYSES OF HEALTH AND INFANT FOODS.

FOOD ANALYZED.	Water.	Fat.	Grape Sugar.	Cane Sugar.	Starch.	Soluble Carbohydrates.	Albuminoids.	Gum, Cellulose, etc.	Insoluble Residue.	Total.	REACTION.
Baby Sup, No. 1	5.54	1.28	2.20	11.70	61.99	14.35	9.75	7.09		100.00	Neutral.
Baby Sup, No. 2	11.48	0.62	2.44	2.48	51.95	23.79	7.92	5.24		100.00	Slightly alkaline.
Gerber & Co.'s Milk Food	6.78	2.21	6.06	90.50	38.48	44.76	9.56			101.79	Slightly acid.
Ridge's Food for Infants	9.23	0.63	2.40	2.20	77.90	5.19	9.24			102.25	Neutral.
Victor Baby Food	7.49	1.68	0.62	19.92	63.45	20.54	8.87			101.97	Slightly acid.
Anglo-Swiss Milk Food	6.54	2.72	23.29	21.40	34.55	46.43	10.26			100.50	Slightly acid.
Horlick's Food for Infants	3.39	0.08	34.99	12.45	none.	87.20	6.71			100.00	Slightly acid.
K. & M. Infants' Food	27.98		36.75	7.58	none.	71.50	none.			100.00	Neutral.
Nestlé's Milk Food	4.72	1.91	6.02	32.93	40.16	44.88	8.23		2.62	100.00	Slightly alkaline.
Hawley's Liebig's Food	6.60	0.61	40.57	3.44	10.97	76.54	5.38		0.55	100.10	Slightly acid.
Hazard's Graham Farina	9.12	0.81	2.19	2.49	69.08	6.35	8.48	5.56		100.00	Neutral.
Cereal Milk	9.33	1.01	4.60	15.40	58.42	20.00	11.08		0.08	100.16	Slightly acid.
Mellin's Food	5.00	0.15	44.69	3.51	none.	85.44	5.95	2.94		100.00	Slightly alkaline.
Blair's Prepared Wheat Food	9.85	1.56	1.75	1.71	64.80	13.60	7.16		3.46	100.00	Neutral.
Savory & Moore's Infants' Food	8.34	0.40	20.41	9.08	36.36	44.83	9.63			100.00	Neutral.
Hubbell's Prepared Wheat Food	7.78	0.41	7.56	4.87	67.60	14.29	10.13	0.44		100.21	Neutral.
American-Swiss Milk Product Co.	5.68	0.81	5.78	36.43	30.85	45.35	10.54	under.		100.00	Acid.
Wheat Flour for Hubbell's Wheat Food	9.02	1.01	2.34	2.46	76.07	5.06	6.40	0.77			Neutral.
Imperial Granum	5.49	1.01	trace.	trace.	78.93	3.56	10.51	0.50		100.00	Neutral.
Robinson's Patent Barley	10.10	0.97	3.08	0.90	77.76	4.11	5.13	1.93		100.00	Neutral.
Farwell & Rhine's Gluten Flour	12.67	0.84	2.23	1.42	68.36	7.23	10.30	0.51		100.00	Neutral.

The microscopic drawings alluded to were made, it is stated, by Dr. A. T. Cuzner.   Recently, in what purported to be a summary of certain information contained in a book entitled " What we Eat and What we Drink," this gentleman has published, under the title of " Food Analyses—Flour," a paper in the *Scientific-American* Supplement No. 414, in which statements are made similar to those advanced by Dr. Cutter, but nominally supported by proofs of quite different character.   The fact that the microscope gives incorrect notions of the relative amounts of gluten and starch is admitted, and the attempt to make a quantitative analysis of flour by the use of this instrument is abandoned.   At the same time the pictures of flour as seen under the microscope are quite different from flour as it actually appears when thus examined.

NO. I.
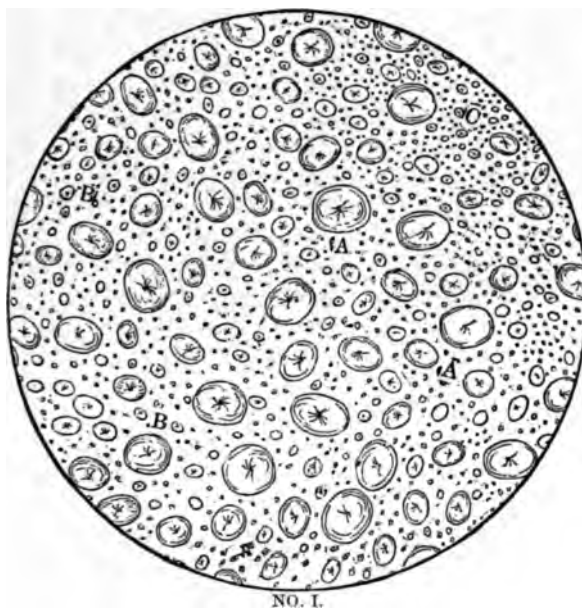
In the accompanying reproduction of the drawing made by Dr. Cuzner, No. 1 —fig. and purporting to be a micrograph of the Pillsbury best flour, the large circles with rays or crosses at their centers, and marked A, are stated to be pictures of giant starch cells.   B to stand for smaller starch cells, and C for granular gluten.   Whether C is a mere dot or a very small circle without a dot in its center, is not clear from the drawing.   But that the smaller starch cells are circles with dots in their centers, appears to have been certainly intended.

This drawing presumably represents the appearance in ordinary light, but in that light starch granules do not exhibit crosses, nor in any light crosses of the character depicted in the drawing. Moreover, gluten cannot be distinguished from starch in the manner stated.

. The next photo-engraving No. II is a reproduction which (to quote the language of the original article) " represents the appearance of the Franklin Mills flour and equally well represents the Health Food Company's Flour, with the exception that in this flour is seen a *much larger proportion* of the bran coat with gluten cells attached, as well as unattached, together with some *hairs of wheat*, than is found in the Franklin Mills flour. In the figure, A, are seen giant

NO. II.

starch cells; B, portion of bran coat; C, portion of bran coat with gluten cells unruptured."
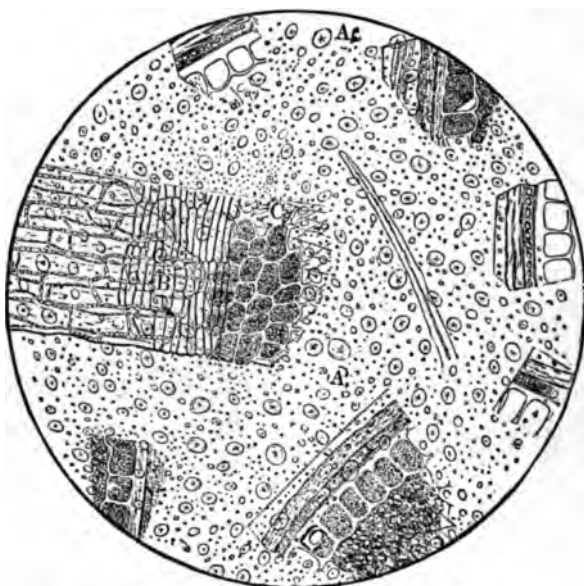
The microscopist will be struck by the remarkable fact that this cut, which is entitled "Health food gluten flour as seen under the microscope," represents a number of thin sections of the wheatberry. Most of these sections are transverse, and represent very beautifully the epicarp, endocarp, testa and secundine of the berry, precisely as they appear when viewed in their natural positions to one another. The largest section is a diagram illustrating the relative position of the three outer coats of the berry as viewed from without. It is a matter of nicety to prepare such excellent sections

of the berry, when it is sliced with a knife, and in the crushed frag-
ments of the berry that remain after it has been ground into flour
I had never seen anything of the character above figured. But,
thinking other observers might have been more fortunate, I looked
through the literature of the subject, and found precisely the same
diagrams as those figured by Dr. Cuzner. In the latter case they
appear in company with giant starch cells (granules?), whose mag-
nitude is comparable with the unruptured gluten cells. In the
former, they appear as illustrations of thin sections of the berry,
Fig. 3 in the above cut No. III showing "the relative position of the

Fig. 4.
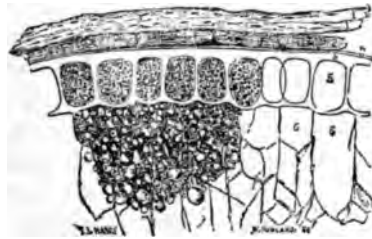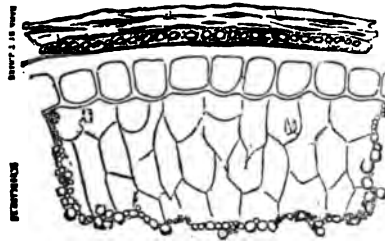
Fig. 2.   Fig. 5.

NO. III.

several layers of the investing coats of the berry, as seen from with-
out; Fig. 4, as viewed in a section transverse to the greater length of
the berry; Fig. 5, as presented in longitudinal section." In the
latter case, as reproduced by Dr. Cuzner, they are portions of what
he saw when Health Food Gluten Flour was examined under the
microscope; in the former, they form the cut which can be found
on page 4, Report on Vienna Bread, printed in 1875 at the Govern-
ment Printing Office in Washington, this report having been written
by E. N. Horsford, U. S. Commissioner to the Vienna International
Exhibition, 1873. I have had this last cut, No. III, reproduced by
photo-engraving to compare with Dr. Cuzner's No. II.

It is needless further to insist upon the worthlessness of mere microscopic inspection in determining the relative composition of flour. But after the erroneous nature of the results arrived at by Dr. Cutter by means of microscopic inspection only had been pointed out, one of his critics, Prof. J. G. Richardson, in an article entiled "A Serious Microscopic Blunder" (Phila. Med. News, June, 1882), called attention to the fact that he or any other physician, without the employment of the more exact methods of chemical analysis, could obtain sufficiently approximate results by simple manipulation of flour, to prevent them from being led astray in the matter. He says:

"Dr. Cutter asserts that the opaque, oval or rounded cells (constituting the fourth coat of the wheat grain, according to Prof. Parkes) afford most of the gluten, and hence on their presence the chief strength of the food depends." He therefore declares that a large number (fourteen) of the food-stuffs he examined, and found under his microscope to display none of these so-called "gluten-cells," "contain no gluten" (page 9), and broadly intimates that they are consequently frauds upon the public. But the fact is, these so-called "gluten cells" (denominated by Payen, oleiferes) probably include in their substance starch, phosphates, fatty matters and coloring materials, containing only parts, perhaps, but a small part, less than one-seventh, of the gluten which exists in wheat. Thus, Peligot, as a mean of fourteen analyses, gives the percentage of gluten in flour (whence " gluten-cells " are removed) at 12.8, while in bran (containing nearly all the "gluten cells ") it is only 10.84, and other observers confirm his statements. If my friend, Dr. Cutter, or any of his disciples, would like to satisfy himself that he has made a lamentable mistake in this matter, let him take say ten grams of one of the fine flours he asserts "contain no gluten," mix it with water into a dough, let it stand for half an hour, and then stir it in a porcelain capsule, with successive portions of water, until the starch is washed away, and the adhesive fibrillated gluten is left nearly pure, in the proportion, after drying, of from seven to twelve per cent. (Vide Parkes' Practical Hygiene, fifth edition, 1878, p. 224.) The small starch-corpuscles and granules, left by this process entangled among the threads of gluten, can be beautifully differentiated by adding a drop of iodine solution, which affords the usual deep-blue reaction with the starch, bnt dyes the gluten filaments of a yellowish-brown tint."

The chemist will recognize in the above extract from Parkes' Hygiene, the result of the investigation of v. Bibra, Millon, Rivot, Ritthausen and others upon the gluten contained in cereals. The method elaborated by these chemists appears to have been adopted after the above suggestions, by Dr. Cuzner, but unfortunately with a modification which robs it at the same time of its simplicity and its value. For instead of manipulating the gluten-dough in a very small flow of water directly between the fingers (which is best), Dr. Cuzner proposes to tie it up in a muslin bag and manipulate this in a jar of water until all the starch is washed out.

His language is: " Having an occasion to make an analysis of certain flours as to the relative amount of starch and gluten they each contained, I thought that the process adopted, being simple and one easily carried out by persons of ordinary intelligence, it would interest your readers and give them the means of ascertaining for themselves the food value of any flour they might at any time be using as food in their families."

Then follows more in detail the process, which is as follows: " A certain portion (2,000 gr.) of each of these flours was mixed with water, separately from the rest, and inclosed in a piece of muslin, as we inclose a pudding. This inclosed dough was then kneaded in a certain amount of water in order to separate the starch from the rest of the flour. During this kneading process, water readily passed through the cloth to the dough, and back again to the remainder of the water, carrying with it on its return the starch cells, albumen and sugar. By continuing this kneading process, the starch, sugar, albumen and gum were finally separated from the gluten, which remained a soft, tenacious, elastic substance, insoluble in water, inside the cloth. The gluten was then removed from the inside of the cloth, moulded, dried, and weighed. The water containing the starch, gum, albumen, and sugar, was placed in a vessel and allowed to stand for some hours, in order that time might be allowed for the starch-cells to settle to the bottom.

At the end of this time the water was poured off and the starch moulded into a cake, dried, and weighed. In the examination of the Franklin Mills' and Health Food Co.'s flour, an additional process was required. During the kneading process, described above, the fine bran with adherent gluten cells was forced through the cloth and became mixed with the starch-cells in the water. This

water had to be filtered through very fine lawn muslin. The starch-cells readily passed through this cloth, but the bran was detained on the muslin, and afterward collected, dried, and weighed. As the purpose of this analysis was not to ascertain the amount of albumen, gum, and sugar contained in the flours, but rather the amount of gluten and starch, the examination was continued no further. But if the reader should desire to ascertain how much albumen, gum, and sugar a certain amount of flour contains, the following process may be adopted. Take the water poured off from the settled starch, and boil it. This will coagulate the contained albumen, which can be collected on a filter, dried, and weighed. The water that passes through the filter can afterwards be evaporated over boiling water, and the gum and sugar collected, dried, and weighed."

An entirely original and quite surprising use of pictorial illustration in connection with analysis is now given. Three rectangular blocks are depicted with sharp angles and perfectly plane sides as representing the dried gluten obtained from the three flours. They are all equally symmetrical, and distinguishable only by the fact that the Franklin Mills gluten cake is large, the Health Food Co. gluten small, and the Pillsbury gluten cake of intermediate size. The striking angularity and symmetry of these gluten blocks which appear as if cut out of steel, is puzzling. Crude gluten, as I have encountered it, is an extremely tough substance of a leather-like consistency, which, on drying, is puffed out by the imprisoned moisture in globular and more or less fantastic shapes.

Three equally symmetrical blocks also in all respects similar, except in size, represent the starch. They have a monumental character, and more closely represent grave-stones than anything in the nature of starch. Difficult as the task would be of moulding crude gluten into rectangular blocks, yet it would be easy of execution compared with that of compacting starch granules into similar masses—an achievement thus far to me quite inexplicable. Two more solid blocks represent bran, that from the Franklin Mills flour small, that from the Health Food Co. large. How bran which has been separated from both starch and gluten can be built up, compacted, dried and weighed in coherent rectangular blocks is not explained.

The author then gives his results, which I have reduced to per

cents. and supplemented with the percentages unaccounted for.

	Bran.	Gluten.	Starch.	Unaccount-ed for.
Pillsbury Best Flour....		13.25 p. c.	80 p. c.	6.75 p. c.
Franklin Mills Flour.. 2.5 p. c.		15.75 "	50 "	31.75 "
Health Food Co. Flour. 7.5 "		7.00 "	45 "	41.5 "

The absurdity of styling that an analysis, in which 30–40 per cent. of the constituents of the flour are to be put down as albumen, gum, sugar, moisture, salts, etc., is manifest.

The process was then tried on some "Pillsbury Best" flour and some Health Food Co. Whole Wheat Flour. 150 grames of each flour were taken, made into a dough, and inclosed in pieces of muslin cloth. These pieces of muslin cloth were previously washed, dried and weighed. They were then kneaded in water until the washings were no longer milky, an operation requiring many hours, when the wash-waters amounting in one case to eight, in the other to ten liters, were collected and allowed to stand. At the end of a week the precipitation of starch was still incomplete, the supernatant liquid appearing milky. The liquid was then syphoned off, great care being requisite to prevent disturbance in the easily moved starch granules at the bottom. How to get rid of the last portions of water, without losing some of the starch, and in case this were successfully accomplished, how the starch could be detached from the vessels and moulded into cakes without loss, these difficulties I saw no way of overcoming. Instead the starch was filtered off upon tared filters, and after drying at 110° in the ordinary manner, was weighed.

The gluten was detached as far as was practicable from the muslin cloth, and after drying the latter, the weight of the gluten which could not be detached was added to the weight of the main portion after drying at 110°. Great care must be exercised to obtain constant weights on drying, owing to the slowness with which the gluten gives up its last portions of moisture. If so many hours and such large amounts of water were requisite to wash the starch through ordinary muslin, the further separation of all this starch from bran by passing it a second time in a state of suspension in water through very fine lawn muslin, appeared impracticable.

The total soluble matter in the filtrates from the starch was determined, and also the crude gluten in the same. This was neces-

sary inasmuch as some of the gluten remained behind, and some passed through the muslin. Microscopic examination showed that the so-called starch contained cellular tissue and gluten, the so-called gluten contained cellulose and starch. Weighings performed on impure products of this kind of course have no real value.

PHYSICAL ANALYSES BY WASHING IN BAGS.

	Pillsbury Best.	Health Food Flour.
Starch	69.25 per cent.	52.92 per cent.
Gluten remaining in bag	3.40 "	21.41 "
Gluten in wash-waters	8.56 "	5.94 "
Soluble matters in wash-water	4.94 "	4.96 "
Water in flour	11.10 "	11.32 "
Total found	97.25 "	96.55 "
Unaccounted for	2.75 "	3.45 "

CHEMICAL ANALYSES OF SAME SPECIMENS OF FLOUR.

Starch	67.86 per cent.	65.19 per cent.
Soluble Alb.	2.84 "	2.30 "
Insoluble Alb.	8.62 "	11.21 "
Total Alb.	11.45 "	13.51 "
Sugar	2.83 "	2.67 "
Gum	5.02 "	3.84 "
Fat	1.31 "	1.63 "
Cellulose	0.81 "	2.35 "
Saline, etc	0.42 "	1.38 "
Phosphoric Acid	0.17 "	0.39 "
Water	11.10 "	11.32 "
Total	100.81	101.89 "

The result of the latter analysis coming out differently from what I anticipated, former analyses having shown that the Health Food Flour contained much the largest amount of albuminoids of any of the many samples of flour analyzed, determinations were made of two more samples of the same flour. They agree better with the former figures, although still falling short in percentage of albuminoids of the results obtained on other samples.

	Lab. No. 1,129.	Lab. No. 1,130.
Starch	58.67	58.35
Gum	2.53	undet.
Sugar	5.39	"
Soluble Albuminoids	2.35	"
Insoluble "	12.16	"
Total "	14.51	13.74
Ash	1.30	1.58
Phosphoric Acid	0.37	0.35
Cellulose	4.06	2.47

During the course of the chemical analyses detailed above, trial was made of the various methods for the analysis of flour heretofore proposed. Attempts were made to substitute direct for indirect determination of several constituents, and at the same time to effect a gain in rapidity of working and in accuracy of results. These attempts have been only in part successful. And inasmuch as the difficulties to be overcome can be best explained in connection with the trials of previous methods, the results of these trials will be stated first.

A. Cairns' Method (Quantitative Analysis, p. 255).

" Digest 5 grms. of the flour in 100 c. c. cold water for one or two hours, with frequent stirring, filter through a filter previously exhausted with hydrochloric acid, washed, dried and weighed, wash with about 100 c. c. cold water. The solution contains : (1) *albumen*, (2) *gum*, (3) *sugar* and a portion of the soluble salts. The residue contains : (4) *celluloses* (5) *starch*, *gluten* and *fat*."

" *Solution.*—1. Boil and then filter ; the precipitate consists of albumen. Dry at 100°, and weigh.

The treatment with water, filtration and precipitation of albumen should be completed on the same day. By keeping the solution hot it may be continued through two days, but this is not advisable."

[NOTE.—These are tedious operations, and of questionable accuracy. Granting that the solution of gum, soluble albumen and sugar is perfect, nevertheless, complete washing by this method is troublesome to effect.]

The precipitation of the albumen on boiling so dilute a solution is also imperfect. In an actual trial, even after concentrating the solution to one-half and boiling, only 37 per cent. of the soluble albumen was precipitated. On evaporating to 40 c. c. an additional precipitate of 52 per cent. was obtained, and to 15 c. c. a third precipitate of .4 per cent. It is not only necessary to collect these precipitates of albumen on weighed filters, but to boil down in tared beaker glasses, because the coagulated albumen attaches itself to the sides of the beaker and cannot be perfectly detached. These 3 determinations of soluble albumen required therefore 9 weighings in all, and the final result was incorrect, falling short of the correct result by 7 per cent. of the amount actually present.

The albumen so obtained should be ignited, and its amount of ash deducted.

" 2. Evaporate the filtrate from the albumen nearly to dryness, add a large excess of alcohol, warm and then allow it to cool, filter on a weighed filter; wash with alcohol. Dry at 100° C, and weigh the gum thus obtained."

[NOTE.—The gum thus precipitated carries down with it some saline matters, and it should be ignited and the weight of ash deducted.]

" 3. Evaporate the alcoholic filtrate from the gum to small bulk, add water, and boil out the alcohol. Concentrate the solution to 50 c. c. and divide into halves. In the first half determine the dextrose directly by copper sulphate solution. In the second half add a few drops of dilute sulphuric acid, boil, neutralize with potassium hydrate and determine dextrose as before. The excess of dextrose found in the second solution is due to cane sugar."

" *Residue.*—Wash with a jet from the wash-bottle into a beaker. Then dry the filter with what adheres to it and weigh. This weight, less that of the filter found at the beginning, gives the weight of adhering substance, which must be taken into account in the subsequent determinations."

[NOTE.—Although the amount left behind is small—in a trial only 0.0815 grm. out of an original weight of 5.3005 grm.—yet this filtration is very tedious and requires two additional weighings.]

" 4. Add to the substance in the beaker 50 times its weight of water, containing one per cent. of sulphuric acid, and heat for several hours, until the starch goes into solution, and only light flocculent cellulose is left. Filter and wash until all sulphuric acid is removed, dry at 100° and weigh. "

[NOTE.—All the albuminoids and starch are not carried into solution by this method, and the weight of cellulose so obtained much exceeds the true amount. The excess, as determined in one trial, was 5 times. The so-called cellulose when submitted to chemical treatment under the microscope was found to have unruptured cells, containing starch granules and undissolved albuminoid bodies.

" 5. To the filtrate from the cellulose, diluted to 400c.c., add about 30c.c. concentrated sulphuric acid, and heat on a water-bath at about 95° for several hours, adding water from time to time to keep it up to the original bulk. Digest this until a drop of the solution shows no coloration when heated with diluted iodine solution, and also gives no precipitate with alcohol. When the conversion of the starch into dextrose is complete, neutralize the excess of acid by sodium or potassium hydrate, and determine the glucose with copper sulphate as before."

[NOTE.—It has been shown by Allihn (J. pr. Chem. xxii,50), and by Salomon that the conversion effected by means of sulphuric acid is only partial, the former authority stating that under the conditions which usually prevail in starch analyses only 95 per cent. of the starch is converted into dextrose. In an experiment in which the results obtained with sulphuric acid were compared with those obtained by means of hydrochloric acid, when used according to Sachse's method (Chem. Centr. 1877, 732), to be given later, I obtained a less discrepant result. Sulphuric acid yielded 98 per cent. of the amount as determined by hydrochloric acid.]

" The starch can also be determined in a separate portion, by washing a weighed quantity with water, then with ether, and again with water, drying and then making an elementary analysis for carbon. The carbon found is from both starch and cellulose. Deduct the carbon due to cellulose found as above (formula, $C_{12}H_{10}O_{10}$ the same as that of starch), and calculate the rest to starch (44 parts carbon = 100 parts starch)."

[NOTE.—This method is tedious, difficult of execution, and inaccurate. After washing with water and ether, and drying as directed, a tough horny cake was left in the filter paper, consisting, in addition to the starch and cellulose, of the insoluble gluten, etc. The physical qualities of this mass were such that it could not be detached from the filter. Even had it been possible to do so, the percentage of one ingredient (the starch) could not have been estimated from a carbon determination, when besides the cellulose, a mixture of at least four substances, such as are present in varying amounts in crude gluten, were undetermined.]

" *Albuminoids.*—Determine the total nitrogen in 1 grm. by combustion with soda-lime, and from this calculate the albuminoids; 15.5 parts N = 100 parts albumenoids. From this deduct the albumen found as above; the difference is gluten."

[NOTE.—It has already been shown that the percentage of albumen found as above, is only a fraction of the amount actually present. The ratio of 15.5 : 100, gives for the nitrogen multiplier 6.45. This is certainly too high. Ritthausen concluded from the results of his elaborate analyses of the wheat albuminoids, that the correct multiplier is 6. Others place it at 6.33, and this number has been employed in making the calculations contained in the present article, except where otherwise stated.]

" *Fat.*—Weigh out 2 or 3 grms. treat with ether, boiling it gently over the water-bath, decant the ether through a filter into a weighed dish, repeat this two or three times, evaporate off the ether, and weigh the fat."

[NOTE.—This method of fat extraction gives results much too low. As thus determined, the Pillsbury flour contained only 1.02 per cent. of fat. When the treatment with ether was continued until no more fat could be extracted, the sample of flour (undried) yielded 1.35 per cent. of fat; dried, it yielded 1.31 per cent. These latter results are in accordance with those stated by König (Nahrungsmittel, p. 559), who recommends that the extraction with ether should be performed on the dried substance rather than on the undried, the latter method usually yielding the higher results. This he attributes, not so much to a decomposition and alteration of the fat, but to a solution in water-holding ether of substances other than fat—such as resin, wax, chlorophyll, etc.]

" *Ash.*—Burn 40 or 50 grms. of the flour in a weighed dish.   If there is any difficulty in burning off the carbon, cool and weigh the dish and contents; then extract with hot water, filter through a small filter, avoiding any transfer of the carbonaceous substance to the filter.   Dry the dish, and weigh again.   The loss represents mineral salts dissolved out.   Moisten with nitric acid, add the filter-paper and contents, burn again, cool, and weigh.   The weight, less that of the dish, represents the remainder of the ash.   The weight of the ash of the small filter-paper may be ignored.   The ash may be dissolved in water with a little nitric acid, and analyzed as required."

[NOTE.—This amount of flour appears enormously greater than needed, except it be desired to make an extended analysis of the ash.   In an actual trial 22.9435 grm. flour was taken, and burned in a platinum capsule, with a small flame placed somewhat to one side of the dish.   The platinum was raised to a red heat only, and contact of a current of heated air with the carbonized mass was favored by this disposition of the flame.   At the end of 8 hours I was surprised to find that the ash was burned perfectly, no carbon remaining.]

An accurate method is given by König (Nahrungs- und Genussmittel, p. 316 & 561).   Ten to twenty grammes of the flour is burned, at first over a small flame, until a black coal remains, and no more smoke is given off.   Then the flame is removed, the coal pulverized, and allowed to stand for some hours in the air.   On now strongly igniting, a very white ash is quickly obtained, or, if necessary, the exposure to air and ignition may be repeated.   This gives the raw ash, which may contain coal, sand, and carbonic anhydride, and is not to be set down as the pure ash or " ash."

To correct for carbonic anhydride, the entire raw ash (from 10 to 20 grms. of substance) is dissolved by hydrochloric acid in a CO_2 apparatus, and its amount subtracted.

The solution so obtained is filtered upon a dried tared filter, repeatedly washed with hot HCl, then with hot Na_2CO_3 and Na HO, in order to remove separated silica, then again with hot water, dried at 100 to 110°, and weighed.   This residue of coal and sand is then to be deducted from the raw ash.

König says truly that CO_2 in the ash of pure cereals is too inconsiderable to necessitate a correction for it.   If the ash does evolve notable CO_2, it indicates an addition of chalk, magnesite, etc.

In nice questions, involving falsifications of the flour, the above method is advisable. But for ordinary determinations a very simple and rapid method, which is given later, will be found accurate.

(To be continued.)

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

The Decomposition of Ammonia by Heat. W. RAMSAY and S. YOUNG.

The object of the researches was especially to determine with accuracy the temperature of dissociation, and the influence of the material of the vessel in which the decomposition is effected. The ammonia gas was obtained from concentrated solution of ammonia and after passing through three tubes containing lime was carried into the decomposition tube which was heated by a Fletcher furnace. The temperature of the furnace was ascertained by the use of salts fusing at known temperatures. The gases escaping from the heated tube were passed first into standard sulphuric acid and the gases unabsorbed (H & N) were collected and measured.

Tubes of porcelain, iron and glass were used, and in some cases filled with fragments of other substances, as asbestos, cardboard, copper wire or spongy copper, broken porcelain, etc. The results show that decomposition begins at a little below 500° C, under the most favorable conditions, but in contact with glass only, at much higher temperatures. The amount of decomposition depends upon time of heating and extent of surface. Under pressure in sealed glass tubes the results were less decisive, as it was difficult to prevent bursting of the tubes. In one case a tube was maintained at 780°, or a little lower, for six hours without appreciable decomposition of NH_3. Recombinations of dissociated gases has been shown to occur to a very minute extent. (*J. Ch. Soc.* CCLVI., 89). A. A. B.

History of the Ammonio-Silver Compounds. S. A. REICHLER. (*Ber. d. ch. Ges.* 1884. 41.) J. H. S., Jr.

On the Validity of the Clausius-Williamson Hypothesis. Examination of a few of Dr. Hans Jahn's Objections. By SVANTE ARRHENIUS. (*Ber. d. ch. Ges.* 1884. 49.) J. H. S., Jr.

On the Numerical laws of the Solid State. P. SABATIER. (*Bul. Soc. Chim.* XLI. 166.) E. W.

On the Fluorides of Sodium. M. GUNTZ.

From a study of the thermal phenomena of solution of NaF and of NaF,HF, the conclusion is reached that hydrofluoric acid is a bibasic acid like sulphuric and not monobasic like hydrochloric. (*Bul. Soc. Chim.* XLI. 168.)   E. W.

Thermo-chemistry—Heat of Formation of Fluorides. M. BERTHELOT.

This is an answer to Tommassi's paper given above. The author says that Tommassi is mistaken as to the importance of his publications. He has not made any experiments, nor has he published any original idea. He has only appropriated laws that have been known for thirty years, the laws of Andrews and of Favre and Silbermann, or law of *modules*. This law itself belongs to a by-gone period; it is not accurate and it is useless to substitute approximate values for the precise numbers found experimentally by Thomsen and by Berthelot himself.

Besides, the law of *modules* does not give the initial number 98.5; this number is obtained by adding the oxidation heat of the metal(=82.3 for potassium, obtained by experiment) to the heat of neutralization of its oxide (=16.2, obtained by experiment.) (*Comptes Rend.* XCVIII. 61.)   P. C.

On the Heat of Combination of Soluble Fluorides. D. TOMMASSI.

The heat of combination of these, as found by Guntz, confirm the law enunciated by Tommassi.

	Heat Units of Combination.	
	Found.	Calculated.
Potassium fluoride	98.4	98.5
Ammonium fluoride {	36.2	35.9
	70.7	70.4

[M. de Forcrand has already stated (Comptes Rendus March 26, 1883) that this is the law of Andrews, published in 1842.) (*Comptes Rend.* XCVIII. 44.]   P. C.

On the Synthesis of Compounds Possessing of a Molecular Rotatory Power. E. JUNGFLEISCH.

Contesting the view of M. Pasteur, that the synthesis of bodies possessed of rotatory power has not yet been accomplished. (*Bul. Soc. Chim.* XLI. 226).   E. W.

On the Speed of the Dissociation of Brass. R. B.
WARDER.

When brass is heated in a current of hydrogen, the rate at which
zinc is volatilized diminishes more rapidly than the whole quantity
of zinc present. Whatever may be the relation between the rate
of loss and the quantity of zinc at the surface, the rate of loss as a
whole is believed to be modified by the slowness with which zinc
diffuses from the interior to the surface of the mass. (*Chem*. *News,*
XLIX, 73). A. A. B.

Phenomena :of Dissociation.—M. ISAMBERT. A mathemati-
cal paper, being a discussion of Berthelot's formula :

$$Q_T = Q_t + {'u} - v.$$

Q_T and Q_t being heats of combination at the temperatures T
and t, and u — v, difference of heats absorbed in passing from t to
T. (*Comptes Rend.* XCVIII, 97.) P. C.

**On the Behaviour of Carbonic Oxide with Air and Moist
Phosphorus.** IRA REMSEN and E. H. KEISER.

On passing purified air through an apparatus specially constructed
for this purpose (all organic matter being excluded), the authors
still obtained a precipitate of barium carbonate in the last wash
bottle, and, therefore, came to the conclusion that the formation of
carbon dioxide could only be due to the presence of carbon in the
phosphorus.

In order to see whether carbonic oxide on being passed over
moist phosphorus would form carbon dioxide, they passed a stream
of air mixed with carefully purified carbonic oxide through the ap-
paratus ; the precipitate of barium carbonate was no greater than
with pure air. The authors therefore came to the conclusion that
carbonic oxide is not oxidized in contact with air and most phos-
phorus. (*Ber. d. ch. Ges.* 1884. 83). J. H. S. JR.

On Hyponitrites. E. DIVERS and M. KAWAKITA.

After alluding to the discovery of the hyponitrites by Divers in
1871, the authors maintain the validity of the formula AgNO
first given by Divers, and discuss the results of Berthelot and
Ogier, which have led these observers to adopt the formula
$Ag_4 N_4 O_5$. The per cent. of Ag obtained by the latter is shown to be

too low, and to have resulted from presence of nitrate or nitrite,
produced by oxidation, and to imperfect washing of the salt. Using
boiled water for washing, the authors obtained a product consider-
ably richer in silver, and by repeated solution and precipitation in
an atmosphere, of CO_2, they finally obtained a salt with 77.06—
77.13% of Ag, which accords more closely with the formula AgNO
than with any other. In preparing the alkaline hyponitrite as a
preliminary step, the original method of Divers, viz., reduction of
the alkaline nitrite or nitrate in solution by sodium or potassium
amalgams is preferred to the methods of Zorn or Menke. (*J. Ch. Soc.*
CCLV., 78).   A. A. B.

New Sulphur Salts Derived from Phosphorus Ter-Sulphide. G. LEMOINE.

Starting from phosphorus sesquisulphide, the author has ob-
tained salts, which may be supposed to be derived from the action
of P O S_5 on H O. (Old style.)

Analogous compounds are also derived from phosphorus ter-sul-
phide P S^3. (Old style.) (*Comptes Rend.* XCVIII. 45.) P. C.

Silicated Chloride of Manganese. M. AL GORGEN.

Obtained by heating at a low red heat. 20 grammes of manganic
chloride and 1 gr. of precipitated silica, and passing a current of
hydrogen and steam. There is formed a button, which is a mixture
of rhodonite, tephroite and the silicated chloride which the author
has studied.

The button is treated with concentrated alcohol, which dissolves
all the chloride. The residue is made of the two silicates which
are bi-refracting and form large laminae, not acting on polarized
light. These are formed from the silicated chloride. Their com-
position is

$$Si \ O^4 \ Mn^{11} \ (Mn \ Cl)^{12}$$
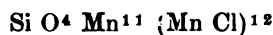
A silicated bromide of manganese is obtained by analagous pro-
cesses. A silicated iodide is more diffiult to obtain. (*Comptes Rend.*
XCVIII. 107.)   P. C.

The Halogen Compounds of Selenium. F. P. EVANS and W. RAMSAY.

From their experiments the authors are led to believe that selen-
ium monochloride splits up on heating into Se and Cl. There is

no indication of the existence of a dichloride. The tetrachloride does not decompose below 200° C., but at high temperatures breaks up rapidly according to the equation 2 $SeCl_4 = Se_2 + 4 Cl_2$, yielding eight volumes of Cl from four of $SeCl_4$. 50% of substance is decomposed at 288°, and 65.74% at 350°. Details in regard to the effect of heat upon selenium chlorobromide are also given together with a table of the corresponding halogen compounds of sulphur and selenium. (*J. Ch. Soc.* CCLV., 62).   A. A. B.

An Experimental Investigation on the Value of Ferrous Sulphate as a Manure for Certain Crops. (Concluded in following number.)   A. B. GRIFFITHS.

The treatment was found to increase the weight of beans as compared with a plot of land untreated and planted with the same crop. The proportion of iron and phosphoric acid in the ash of the stalks and leaves was increased to a marked extent, but the composition of the seeds was little affected. (*J. Ch. Soc.* CCLV. 71). A. A. B.

On a New Method of Preparing Barium Permanganate.   G. ROUSSEAU and B. BRUNEAU.

To a cold saturated solution of potassium permanganate (100 gms. in 1500 to 1600 gms. water) are added 300cc. of hydrofluosilicic acid of 30° B. The mixture is allowed to stand for some time, then filtered through asbestos, and then neutralized by milk of baryta in quantity sufficient to about neutralize the amount of hydrodfluosilicic acid originally used. Barium carbonate will not serve here, as it will precipitate the whole of the manganese as hydrated peroxide. The solution is allowed to settle, decanted, and evaporated. By re-dissolving and again evaporating a pure product is obtained. (*Bul. Soc. Chim.*, XLI. 246).   E. W.

Zinc in Drinking-water.   C. W. HEATON.

Spring water, originally free from zinc, was found to contain 6.41 grains of $ZnCO_3$ per gallon, after flowing half a mile through a galvanized iron pipe. (*Chem. News*, XLIX, 85).   A. A. B.

Russian Chemical Society. Correspondence of M. O. Davidoff.

M. Wilne in separating the base metals of platinum ore by BaCo has found a compound the reactions of which differ from those of

compounds of known elements. He desires to preserve the right to continue his researches.

M. Alexieff presented results of a thermochemical examination of the effects of mixing solutions of different substances.

M. Sturm has studied the changes in concentration of solutions filtered through a mixture of pulverized quartz, $CaCO_3$, $CaSO_4$ and stilbite.

M. Kouznetzoff's analysis of Rotschoubeite from the Yougine mine was presented.

SiO_2	32.43	FeO	1.63
Cr_2O_3	5.32	CaO	0.32
Al_2O_3	12.20	MgO	34.11
Fe_2O_3	0.50	H_2O	14.42

Bul. Soc. Chim., XLI., 253.   E. W.

Preparation of Chromic Sulphate.—H. BAUBIGNY.

Cr_2O_3 is precipitated from potassium dichromate by treatment with hydrogen sulphide, and thoroughly washed. The chromic oxide is dissolved in a minimum quantity of nitric acid and by the action of heat, the violet salt is obtained. A slight excess of sulphuric acid is added and by means of alcohol the violet sulphate is thrown down. This salt is filtered rapidly, dissolved in weak sulphuric acid, re-precipitated by alcohol and purified by two solutions in water and two precipitations by alcohol. After every precipitation the sulphate is dried in a centrifugal.

The sulphate may also be prepared from chlorochromic acid, by reducing with alcohol. The violet sulphate is obtained by proceeding as above, after adding sulphuric acid diluted with 2 or 3 times its volume of water. (*Comptes Rend.* XCVIII. 100.)   P. C.

Preparation of Large Quantities of Attenuated Cultivations of Anthrax Virus. A. CHAUVEAU.

The object is to prepare sufficiently large quantities to vaccinate 8,000 sheep.

There are two series of operations.

A drop of infected blood is taken from a guinea pig and introduced into a flask containing 20 c. c. of sterilized broth. The culti-

vation is carried on for 10 hours at a temperature of 43° C. The cultivation liquid is afterward heated to 47° C.

The second series of operations is carried on in flasks of 1 litre to 2 litres, according as there are 4,000 or 8,000 sheep to be vaccinated.

These flasks are Wollf's bottles with three tubulures, nearly filled with the cultivation liquid. The middle tubulure has in it a tube drawn to a narrower portion at the lower end and provided with a cotton plug. By this tube the air enters and bubbles through the liquid, keeping it in motion. One of the other tubulures communicates with an aspirator, while the third is provided with a fine tube to empty the flask. This last tube also serves for introducing the organism to be cultivated ; 1 drop of previous cultivation to be introduced for every 10 c. c. of liquid.

This apparatus is kept at 35°–37 C, and the cultivation would take place very slowly if the liquid were not stirred by the continual passage of air through the liquid, which causes a profuse production of organisms.

Chicken broth (1 part of lean meat to 4 or 5 parts of water) has given the best results as a cultivating liquid. (*Comptes Rend.* XCVIII. 73.)   P. C.

Antiseptics and Bacteria. P. MIGUEL.

An article published in "Annuaire de Météorlogie," for 1884. From a table there given the following data are taken. The quantities represent the weights in grammes of antiseptics, which prevent the putrefaction of 1 litre of neutralized beef broth.

	Gr.
Mercuric iodide	0.025
Silver iodide	0.030
Hydrogen peroxide	0.050
Mercuric chloride	0.070
Silver nitrate	0.080
Osmic acid	0.15
Chromic acid	0.20
Chlorine	0.25
Iodine	0.25
Auric chloride	0.25
Platinic Chloride	0.30
Hydrocyanic acid	0.40

Bromine_____ 0.60
Cupric chloride_____ 0.70
Chloroform_____ 0.80
Cupric sulphate_____ 0.90
Salicylic acid_____ 1.00
Benzoic acid_____ 1.10
Potassium cyanide_____ 1.20
Aluminic chloride_____ 1.40
Zinc chloride_____ 1.90
Sulphuric, nitric, hydrochloric and phosphoric acids___2.00 to 3.00
Carbolic acid_____ 3.00
Alum_____ 4.50
Tannin_____ 4.80
Arsenious acid_____ 6.00
Boracic acid_____ 7.00
Ethylic alcohol _____ 95.00
Sodium hyphosulphite_____275.00

"This list will cause surprise in many quarters. The only criticism permissible is to repeat the experiments of M. Miguel."

Mention is made of the fact that naphthalene is powerless as an antiseptic when purified from phenol and other bodies. Even when present in such quantities that the beef broth is filled with solid pieces, the development of bacteria is not prevented. (*Mon. Scientifique.* 3. XIV. 170.)   P. C.

ORGANIC CHEMISTRY.

Contributions Towards a Knowledge of the Indulines
O. N. WITT.

The indulines belong to a class of bodies, which are produced in many reactions, and depend usually upon the occurrence of some secondary reaction. Their formation and constitution is therefore, still obscure.

In the ordinary formation of induline from amidoazobenzole and aniline, the presence of ammonia is always observed. Besides the formation of the typical induline $C_{18}H_{15}N_3$, the author has observed the presence of a series of more complicated byproducts

If phenylated amidoazobenzole be used, the reaction takes a different shape. If phenylamidoazobenzole and aniline chloride are heated together, no ammonia is formed, and the product obtained is free from complex byproducts.

As phenylamidoazobenzole and induline are isomeric, it seemed probable that, under the influence of aniline chloride, a molecular change might take place. This idea, however, was found to be untenable. If Tropaeoline O. O. is substituted for phenylamidoazobenzole, however, in this case, the addition of aniline chloride is not even necessary. The aniline salt of this acid (Tropaeoline O. O.), heated with an excess of aniline, forms induline, and regenerates sulphuric acid. A reduction and splitting up of the azo-group has taken place, the hydrogen required being derived from the aniline present, and this, on combining with the amidodiphenyl-amine produced during the reduction, forms induline.

The higher homologues of phenylamidoazobenzole, behave in the same way.

Diazoparatoluole and diphenylamine, form a compound crystallizing in yellow leaflets, melting point 109—110° C, and soluble in strong sulphuric acid with a green color.

The corresponding derivative of 1 : 2 : 4 metaxylidine forms golden yellow crystals, melting point 142—143° C.

By substituting other secondary amines for diphenylamins, amidoazo-compounds are formed, which, under the action of salts of primary aromatic bases, form a whole series of induline dye-stuffs.
(*Ber. d. ch. Ges.* 1884. 74.)   J. H. S., JR.

On Indophenoles. O. N. Witt.

In the beginning of this year, Nietzki published a paper on the examination of saffranins, in which he described the constitution of dimethylaniline green, and toluylene blue, or at least its leuko-base. From these data the constitution of leukindophenole was established. Thus, if toluylene white has the following constitution :

$$C_6H_4-N\begin{smallmatrix}CH_3\\CH_3\end{smallmatrix}$$
$$|$$
$$NH$$
$$|$$
$$C_6H_3\begin{smallmatrix}NH_2\\NH_2\end{smallmatrix}$$
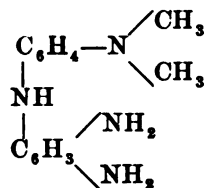
Leukindophenole must be constituted as follows :

$$C_6H_4-N\begin{smallmatrix}CH_3\\CH_3\end{smallmatrix}$$
$$|$$
$$NH$$
$$|$$
$$C_{10}H_6OH$$
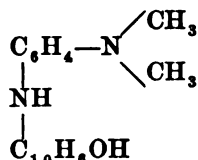
(*Ber. d. ch. Ges.* 1884. 76.)   J. H. S., Jr.

On Orthoamidoazo-Compounds. Emilio Nölting and O. N. Witt.

It has until recently been assumed that by acting with diazo-compounds upon amines or phenoles, that amido- or oxyazo-compounds could only be formed when such amine, or phenole, had its para-position unoccupied.

The authors find that the above hypothesis does not hold true, as they have succeeded in producing amido-azo-compounds, in which the —N═N— groups stand in the ortho-position.

Starting from para-toluidine, they produced first diazoamidopara-toluole, and this was converted into amidoazoparatoluole, which appears as beautiful, orange-red, lustrous needles, easily soluble in alcohol and acetic ether. Melting point 118.5° C. Reducing agents split up this new compound into paratoluidine and orthotoluylen-diamine. (*Ber. d. ch. Ges.* 1884. 77).   J. H. S., Jr.

On the Lutidine of Coal Tar. M. Oechsner de Coninck

The fraction boiling at 153°.5 to 154°.5 constituted the base,

C_7H_9N. Specific gravity 0.9443, vapor density determined by Meyer's apparatus 3.6 to 3.9, colorless Mobile liquid, with an acrid and penetrating odor, quite distinct from that of pyridine. The fumes provoke violent headache. The chloro platinate was examined and found to agree in composition with that demanded by theory. It combines very slowly with ethyl iodide. The conclusion of the author that the lutidine of coal tar is an ethyl pyridine while picoline is a methylpyridine, is regarded as confirmed.

The most marked character of this lutidine is its perfect miscibility with water in all proportions.

By oxidation with potassium permanganate, an acid melting at 308° and exhibiting the other properties of isonicotricic acid was obtained. (*Bul. Soc. Chim.*, XLI. 249). E. W.

Theoretical Considerations on Isomerism in the Pyridine Series. MM. OECHSNER DE CONINCK and J. C. ESSNER.

Facts are cited tending to indicate that pyridine instead of being a monosubstituted benzine constitutes in itself a special group. (*Bul. Soc. Chim.* XLI. 175.) E. W.

Pyridine Derivatives. C. BÖTTINGER.

The following compounds are described:

Picoline carbo-acid, crystallizes with one mol. of water of crys tallization, which may be driven off at 100° C.

Pyridine carbo-acid, crystallizes with one mol. water of crystalli zation ; has slightly basic properties ; dissolves easily in sulphuric and hydrochloric acids.

Pyridine tricarbo-acid. Several salts of this acid are described. (*Ber. d. ch. Ges.* 1884. 92.) J. H. S., Jr.

Pyridine Compounds obtained by Condensation. C. BÖTTINGER.

The author states that by treating an aqueous solution of imido-pyrotartrate of ammonia with the fumes of bromine, he obtained uvitonic acid, which was recognized by the analysis of its silver salt. (*Ber. d. ch. Ges.* 1884. 53.) J. H. S., Jr.

On the Action of Ethylene Bromide on Malonic Acid Ether. W. H. PERKIN, JR. (*Ber. d. ch. Ges.* 1884. 54.)

Trimethylendicarbo-acid Ether.

This was obtained from 30 grms. malonic acid ether, by treating it with 9 grms. sodium and 100 grms. absolute alcohol.

FORMULA.

$$C\ OO\text{---}C_2\ H_5$$
$$\begin{array}{c} \diagup C\ H_2 \\ C \diagdown \ | \\ | \quad C\ H_2 \\ C\ OO\text{---}C_2\ H_5 \end{array}$$

Trimethylendicarbo-acid.

$$COOH$$
$$\begin{array}{c} \diagup CH_2 \\ C \diagdown \ | \\ | \quad \diagdown CH_2 \\ COOH \end{array}$$
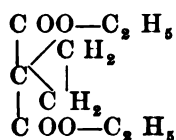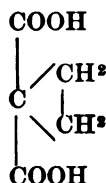
Obtained from the ether by heating it with alcoholic potash.

Trimelthyenmonocarbo-acid.

$$CH_2$$
$$\diagup \quad \diagdown$$
$$CH_2\text{---}CH\text{---}COOH.$$
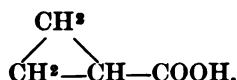
Obtained from trimethylen-dicarbo-acid by heating it on the oil bath to 210°C. (*Ber. d. ch. Ges.* 1884. 54.) J. H. S., JR.

On Benzoylacetic Acid. ADOLPH BAEYER and W. H. PERKIN, JR.

The authors after a few preliminary remarks describe the following compounds :

Diethyl Ether of Dibenzoylsuccinic Acid.

Colorless, small prisms, melting point, 125–126°C.

Monolactone of Dibenzoylsuccinic Acid.

Small needles, with brownish color. Melting point 230°C. Sparingly soluble in water, but easily soluble in alcohol, ether and benzole.

Dilactone of Dibenzoylsuccinic Acid.

Colorless leaflets, with silver colored lustre. Melting point, 254–255°C. At this temperature it undergoes decomposition. (*Ber. d. ch. Ges.* 1884. 57.)   J. H. S., Jr.

On the action of Chlor-and Bromacetone, Acetophenone-bromide and Phenylbromacetic Acid on Acetacetic Ether.
A. Weltner.   (*Ber. d. ch. Ges.* 1884. 66.)
                                                    J. H. S., Jr.,

Nitriles and Carbo-Acids from Aromatic Amines.   K. Gousiorowski & V. Merz.

The authors prepared benzonitrile by heating formanilide and zinc dust in a flask with return cooler. This was formed according to the following reaction:

$$C_6H_5 - N \begin{matrix} \diagup COH \\ \diagdown H \end{matrix} + Zn = C_6H_5 - N = C + ZnO + H_2$$

$$C_6H_5N = C = C_6H_5 - C = N$$
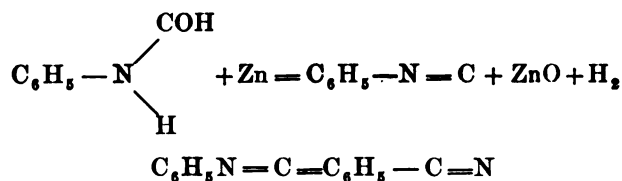
From this benzoic acid was obtained.

Similar results are obtained from formoorthotoluide, only in this case the acid obtained from the nitrile corresponds to ortho-toluylic acid. Melting point 102° C. (*Ber. d. ch. Ges.* 1884. 73.)
                                                    J. H. S., Jr.

On the Violet Derivatives of Triphenylmethane. O. Fisher and G. Köerner.

The authors describe a new synthesis of hexamethylparaleukan-iline. 1 pt. ethyl ether of orthoformic acid, ¾ pts. dimethylani-line, and 2 pts. of zinc chloride are heated on the water bath. The melt is freed from excess of dimethylaniline by steam, dissolved in HCl, and poured into cold ammonium hydrate, which precipi-tates the base. After one crystallization it is perfectly pure; crys-tallizes in beautiful silvery leaflets. M. P. 172—173° C.

This compound is formed according to the following equation:

$$CH \begin{cases} O-C_2H_5 \\ O-C_2H_5 \\ O-C_2H_5 \end{cases} +3C_6H_5N(CH_3)_2 = CH = (C_6H_4N < \begin{matrix} CH_3 \\ CH_3 \end{matrix})_3$$

$$+3 \ C_2H_5OH$$

(*Ber. d. ch. Ges.* 1884. 98.)   J. H. S., Jr.
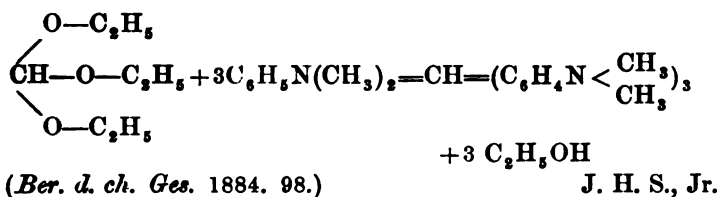
On a New Method of Producing Acridine. O. FISHER AND G. KÖRNER.

One pt. of chloroform, 1 pt. diphenylamine, and $\frac{1}{2}$ pt. of zinc oxide are heated under pressure. The formation may be explained by the following reaction:

$$C_6H_5-NH-C_6H_5 +CCl_3H+ZnO=C_{13}H_9N+ZnCl_2$$

(*Ber. d. ch. Ges.* 1884. 101.)   J. H. S., Jr.
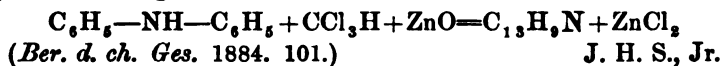
On Methylen Blue. RICHARD MÖHLHAU.

The author agrees with Bernthsen in giving methylen blue chloride the following formula:
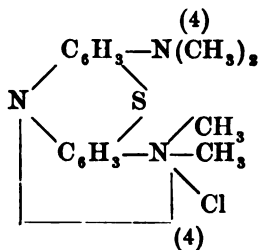
(*Ber. d. ch. Ges.* 1884. 102.)   J. H. S., Jr.

On the Synthesis of Pyrocoll. G. L. CIAMICIAN and P. SILBER. (*Ber. d. ch. Ges.* 1884. 103.)   J. H. S., Jr.

On Paraamidofluorene. JOS. STRASBURGER.

This compound was obtained by reducing paramononitrofluorene with tin and HCl.

p. Mononitrofluorene

$$\begin{matrix} & (4) \\ C_5H_3 & \!\!\!-NO_2 \\ | \quad (1) & \!\!\!\searrow CH_2 \\ | & \!\!\!\nearrow \\ C_6H_4 & \end{matrix}$$

p. Amidofluorene

$$\begin{matrix} & (4) \\ C_6H_3 & \!\!\!-NH_2 \\ | \quad (1) & \!\!\!\searrow CH_2 \\ | & \!\!\!\nearrow \\ C_6H_4 & \end{matrix}$$
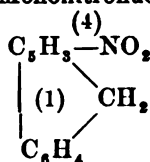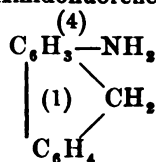
Light brown colored needles melting at 124—125° C. (*Ber. d. ch. Ges.* 1884. 107.)   J. H. S., Jr.

On a few Naphthaline Derivatives. Eug. Lellman. (*Ber. d. ch. Ges.* 1884. 109).   J. H. S., Jr.

On Tetramethylbenzidine. W. Michler and H. Pattinson.

This compound was produced by heating dimethylaniline dissolved in sulphuric acid, and adding by degrees 3 mols. of lead peroxide. The platinum salt of this compound has the following formula:

$$\begin{matrix} C_6H_4N(CH_3)_2HCl \\ | \qquad\qquad\qquad +PtCl_4 \\ C_6H_4N(CH_3)_2HCl \end{matrix}$$
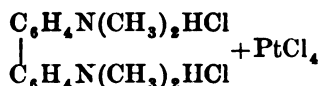
A tetramethylbenzidine was also produced directly from benzidine by treating it with methyl iodide and methyl alcohol.

(*Ber. d. ch. Ges.* 1884. 115.)   J. H. S., Jr.

On the Preparation of Orthonitrobenzaldehyde. Alfred Einhorn.

The soda salt of orthonitrocinnamic acid is dissolved in water and oxidized with potassium permanganate. The mixture is shaken up with benzole during the whole process of oxidation, which removes the orthonitrobenzaldehyde the moment it is formed, and after the reaction is ended the nitrobenzaldehyde is obtained in a solid state by distilling off the benzole. Yield, 50–53%. (*Ber. d. ch. Ges.* 1884. 119.)   J. H. S., Jr.

On Derivatives of Hydrindonaphthene. A. Baeyer and W. H. Perkin, Jr. (*Ber. d. ch. Ges.* 1884. 122.) J. H. S., Jr.

Researches on the Gums of the Arabin Group,
 Part I. Arabic Acid, its Composition and the Products of its Decomposition. C. O'Sullivan.

Gum arabic, ordinary Levantine gum, is stated to be a salt of arabic acid, with potash, lime or magnesia. The results of Mulder,

Neubauer, Scheibler and earlier investigators are conflicting, and leave the true composition undecided. The author separated the acid by the method of Neubauer in the main. Successive portions of the acid obtained by fractional precipitation were found to be practically identical in their action on polarized light, and in their precipitates with BaO, showing the acid to be a homogeneous body. The decomposition products of arabic acid by H_2SO_4 were then studied as affording a possible clue to its condition. These products, according to Schiebler, are a crystallined and a non-crystalline sugar, and an acid of which the Ba salt is insoluble in alcohol. The latter was first precipitated by the author, and after precipitation submitted to fractional decomposition by H_2SO_4, whereby it yielded two acids, the Ba salts, of which contained respectively 13.4%, corresponding to the formula $C_{29}H_{48}O_{27}$ BaO and 15% of BaO. The latter, by further action of H_2SO_4, gave a new salt requiring 18.68% BaO, and an uncrystallizable sugar of the $C_6H_{12}O_6$ class. The acid of the last salt agreed most closely with the formula $C_{23}H_{38}O_{22}$BaO, corresponding to a carbohydrate —CH_2+O_2. The relation between the salts of the two acids is indicated by the equation

$$C_{29}H_{48}O_{27}BaO + H_2 = C_{23}H_{38}O_{22}BaO + C_6H_{12}O_6,$$ and

the three Ba salts differ from one another by the group $C_6H_{10}O_5$, which, in the decomposition of the salt, is hydrated to form a sugar of the $C_6H_{12}O_6$ class. The arabic acid molecule, in breaking down, yields with simultaneous hydration, a series of acids, each one differing from its neighbor by $C_6H_{12}O_6$.

Arabic acid has the formula $C_{89}H_{142}O_{74}$, and its Ba salt has 6.00% of BaO. The paper is devoted mainly to establishing the constitution of arabic acid. Four different sugars (α. β. & γ arabinose), resulting from separate stages of the decomposition of arabic acid are shown to exist and to be defined by their difference in rotation and copper-reducing properties. The different acids (α. β. & γ arabinosic acids) are partly defined, the details being left for a later investigation.

Arabic acid $[\alpha] = -27°-28°$ is the chief constituent of all laevo-rotatory Levantine, E. Indian, Senari and Senegal gums, but other acids are also present in these gums which the author believes to bear simple relations to arabic acid. Some high-rotating gums are believed to contain acids of large molecule, and to be related to arabic acid, as it is itself related to the arabinosic acids above mentioned. (*J. Ch. Soc.* CCLV., 41).   A. A. B.

On the Preparation of Pure Chlorophyll. A. TSCHIRCH.

The belief in the comparative stability of chlorophyll, which has hitherto been held, is regarded by the author as an error and to be the source of failure in preparation of the pure substance. Previous attempts to separate it have been based upon the action of energetic chemical agents, by which chlorophyll itself has been destroyed. The crystalline chlorophyll of Gautier and Rogalski is found to be identical with the chlorophyllan of Hoppe-Seyler, and is a product of the oxidation of chlorophyll; also the pure chlorophyll of Berzelius, Mulder and Pfaundler is identical with Fremy's phyllocyanic acid. These two bodies agree perfectly in their absorbtion spectra, but are shown by their behavior with caustic alkalies to be totally distinct substances. Chlorophyll is decomposed by weak acids, even by the vegetable acids in leaf cells, which accounts for the spontaneous decomposition of chlorophyll tinctures as shown by the changing spectra. It is also decomposed during extraction from the leaf by solvents, through the same agency. Saponification of chlorophyll extracts is equally ineffective in securing the pure substance. The author defines pure chlorophyll as the substance which yields a spectrum identical with that of the living leaf, and obtains this substance through reduction of chlorophyllan in alcoholic solution of zinc dust on the water bath. The solution thus obtained is in the form of blackish-green drops, which have not yet been made to crystallize. It is soluble in alcohol, ether, benzene, fatty and volatile oils, sparingly soluble in fused paraffin, and insoluble in hot water. It is decomposed by concentrated and dilute acid and by caustic potash. The alcoholic solution is much less sensitive to light than ordinary chlorophyll tincture. The article concludes with a table of synonyms relating to bodies of the chlorophyll group. (*J. Ch. Soc.* CCLV., 57). A. A. B.

Preparation of Glyoxal. R. DE FORCRAND.

The product resulting from the action of nitric acid on aldehyde was taken up with a small amount of water, saturated with calcium carbonate and filtered, then precipitated with a slight excess of concentrated solution of bibasic lead acetate, filtered, exactly enough oxalic acid added to precipitate the lime, and evaporated on the water bath. The product is purified by drying in vacuo at a temperature not exceeding 110° to 120°. After this, however, it is not

absolutely pure. The yield amounts to about 18 per cent. of the amount of aldehyde used. (*Bul. Soc. Chim.*, XLI. 240). E. W.

Transformation of Glyoxal into Glycolic Acid. R. DE-FORCRAND.

Glyoxal prepared as above dissolves in alkalies forming glyco lates. The author gives an account of some thermochemical investigations on this reaction. (*Bul. Soc. Chim.*, XLI. 244). E. W.

On the Decomposition of Compounds Optically Inactive by Compensation. E. JUNGFLEISCH.

Ordinary, crystallized paratartrate of soda and ammonia contains two forms, a right and a left-handed salt, the solubilities of which have been considered practically the same. By making a supersaturated solution, and introducing simultaneously, in different places in the solution, a right-and left-handed crystal, the two salts were separated. As the right-handed crystals separated in larger proportion at first, the conclusion is that the right-handed salt is somewhat more insoluble. (*Bul. Soc. Chim.*, XLI. 222). E. W.

On the Decomposition of Silver Fulminate by HCl. E. DIVERS and M. KAWAKITA.

Formic acid and hydroxyammonium chloride were produced as in the case of the mercury salt, but only $\frac{2}{3}$ of the calculated quantities of these bodies were obtained. Ammonia and a trace of HCN were also obtained, but the authors have failed as yet to find what becomes of the rest of the carbon and nitrogen. The silver salt used contained 71.79% Ag. Theory requires 72%. (*J. Ch. Soc.* CCLV., 75). A. A. B.

Heat of Combustion of Some Ketones and of two Carbonic Acid Ethers. N. W. LONGUININE. P. C.

$$\text{Diethylketone } \begin{matrix} C_2 H_5 \\ C_2 H_5 \end{matrix}\!\!> CO$$
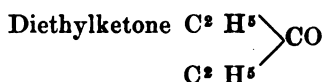
Average of 3 experiments give 8569 heat-units for 1 gramme of substance burnt, or 736934 heat-units for 1 molecule.

$$\text{Dipropylketone, } \begin{matrix} C_3 H_7 \\ C_3 H_7 \end{matrix}\!\!> CO$$
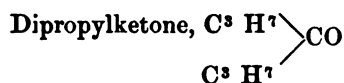
Average of 5 experiments, 9244.5 heat units for 1 gramme or 1053873 for 1 molecule.

Diisoprophylketone, $CH (CH^3)^2 CO$

Average of 4 experiments, 9172.4 heat-units for 1 gramme, 1045654 heat-units for 1 molecule.

Methylhexylketone, $\begin{array}{c} CH^3 \\ \\ C^6H^{13} \end{array}\rangle CO$

Average of 3 experiments, 9467 heat-units for 1 gramme, 1211789 for 1 molecule.

Conclusions: The differences between the heats of combustion of dipropylic and diisopropylic ketones (1053873 and 1045654) = 8219 heat units or 0.8 of 1 p. c., which is within the limit of error for experiments of this nature.

The difference between the heat units of dipropylketone (1053873) and of diethylketone (736954) is 316969 for 2(CH^2), or 158484 heat units for CH^2. The difference between the heat of combustion of methylethylketone (1211789) and dipropylketone (105387) = 157916 for CH^2, very nearly the same result as above.

The author has also studied two ethers of carbonic acids :

Methylcarbonic ether, $\begin{array}{c} CH^3O \\ \\ CH^3O \end{array}\rangle CO$

Average of 4 experiments, 3774.3 heat units for 1 gramme, and 339691 for 1 molecule.

Diethylcarbonic ether, $\begin{array}{c} C^2H^5O \\ \\ C^2H^5O \end{array}\rangle CO$

Average of 5 experiments, 5442.8 heat units—for 1 molecule, 642250.

The difference of the heats of combustion of these two ethers is 302559 for 2 (CH^2), or 151280 for CH^2, which is a little less than was found by comparison of two ketones.

By comparing the combustion heats of diethylketone and of ethylcarbonic ether, we see that the introduction of 2 atoms of oxygen has given a diminution of 94684 heat units or 47342 for 1 oxygen atom. (*Comptes Rend.* XCVIII. 94.)   P. C.

On Camphoric Peroxide and Camphorate of Barium.
C. T. KINGZETT.

Brodie has stated (Phil. Trans. 1863, p. 407) that a barium

salt of camphoric peroxide is obtained by triturating camphoric anhydride with an equivalent of BaO_2 in ice-cold water. This statement is questioned by Kingzett who interprets the facts presented by Brodie in another way. Camphoric anhydride becomes camphoric acid in presence of water, and this acting on BaO_2 sets free H_2O_2 and forms barium camphorate. Experiment shows this hypothesis to be the true one.

The following reactions which are found to occur separately, will take place in succession under the conditions of Brodie's experiment, viz:

Camph. Anhydride.   Camph. Acid.
(1) $C_{10}H_{14}O_3 + H_2O = C_{10}H_{16}O_4$
(2) $BaO_2 + C_{10}H_{16}O_4 = C_{10}H_{14}BaO_4 + H_2O_2$.
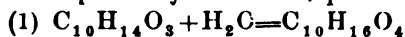
(*J. Ch. Soc.* CCLVI., 93).   A. A. B.

On Strychnine. (First note.) M. Harriot.

The presence of brucine interferes with the bichromate test for strychnine. If the proportion of strychnine is large, the brucine can be first destroyed by nitric acid, when the strychnine reactions can be obtained. Many commercial samples of brucine no doubt contain strychnine, and the suggestion is made that possibly the toxic effects attributed to brucine, may be partly or entirely owing to such admixture of strychnine. In conjunction with M. Blarez, the author has noted that concentrated solutions of strychnine salts are precipitated by any acid, preferably by the acid already existing in the salt. The precipitate re-dissolves in an excess of the acid, and is re-precipitated by water, provided that too large an excess of acid has not been used.

The mode of preparation and properties of dinitrostrychnine and diamidostrychnine are described. (*Bul. Soc. Chim.*, XLI. 233).
                                                              E. W.

Ferric Ethylate and Colloidal Ferric-hydrate—by M. Ed. Grimaux.

By treating 1 molecule of ferric chloride, dissolved in absolute alcohol, with six molecules of sodium ethylate, a precipitate of Na Cl is obtained, and a reddish brown solution, which does not give the reaction of chlorine.

By distillation over a water bath a black, pasty mass is obtained which is soluble in absolute alcohol, benzine, chloroform, petroleum, and methylic alcohol.

The alcoholic solution is not precipitated by gaseous ammonia. If the alcoholic solution is left in contact with air, moisture is absorbed and a thick coagulum of ferric hydrate obtained. If a large quantity of water is added, a limpid liquid is obtained, presenting all the characters of Graham's solution of colloidal ferric hydrate. After a time the solution coagulates spontaneously. Heat coagulates it at once. The rest of the paper is taken up with a study of the conditions of coagulation, leading to the conclusion that mineral colloïds behave like nitrogeneous animal colloïds. (*Comptes Rend.* XCVIII. 105.)   P. C.

On the Occurrence of a Phenol in the Stem and Leaves of Pinus Sylvestris. A. B. GRIFFITHS.

Phenol is identified in a hot-water extract of the materials by means of ferric chloride and bromine water, and by the coagulation of albumen. (*Chem. News*, XLIX, 95).   A. A. B.

Remarks on the Chemistry of Plants. M. BALLO. (*Ber. d. ch. Ges.* 1884. 6.)   J. H. S., Jr.

Action of Solutions of Cellulose in Schweitzer's Reagent on Polarized Light. A. LEVALLOIS.

The plane of polarization is strongly turned to the left, but this deviation is not proportional to the degree of concentration of the solution. The celluloses were from linen, cotton Berzelius paper and German filtering paper. (*Comptes Rend.* XCVIII. 44.)
                                                          P. C.

On the Action of Hydrocarbons of the Acetylene Group, on Oxide of Mercury and its Salts. M. KUTSCHEROFF.

If allylene, at the ordinary temperature, be passed through a solution of corrosive sublimate, the latter soon becomes turbid, and after a while deposits a copious, white, crystalline precipitate. During this reaction HCl is evolved, which may be easily recognized by means of litmus paper. On analysis, the purified precipitate gave figures which lead to the following formula :

$$3\ Hg\ Cl_2.\quad 3\ HgO.\quad 2\ C_3\ H_4.$$
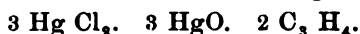
The precipitate is insoluble in water and cold alcohol, but is easily soluble in hydrochloric and acetic acid, undergoing decomposition and splitting up into the corresponding mercury salt and acetone.

The process may be explained by the following reactions:

(1) $6 \ Hg \ Cl_2 + 3 \ H_2O + 2 \ C_3 \ H_x = 3 \ Hg \ Cl_2.$ $3 \ Hg \ O.$ $2 \ C_3H_4 + 6 \ H \ Cl.$

(2) $3 \ Hg \ Cl_2.$ $3 \ Hg \ O.$ $2 \ C_3 \ H_4 + 6 \ H \ Cl = 6 \ Hg \ Cl_2 + 2 \ C_3 \ H_6O + H_2O.$
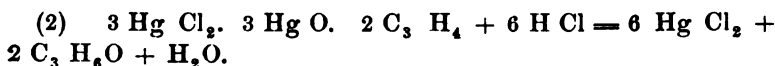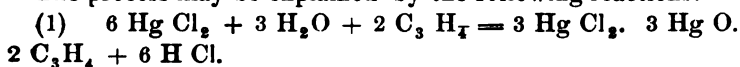
These two reactions can, according to circumstances, be made to take place separately or together, as may be desired. Mercuric bromide seems also to react on allylene, while, on the other hand, mercuric iodide does not. After experiments, the author concludes:

1. That allylene reacts with all mercuric salts, but that the products obtained differ from one another, according as the reactions took place in acid or alkaline solutions.

2. The hydration of allylene by means of mercuric salts is characteristic of the general reaction of this hydrocarbon with mercuric salts in acid solutions. In this case, also, complex mercuro-acetone compounds are formed, but are decomposed the moment they are formed, with liberation of acetone.

3. The structure of ketones, in relation to that of the hydrocarbons, which are derived from the latter by means of mercuric salts, may be determined according to the following rule :

In unsymmetrical hydrocarbons, the hydrogen of the molecule of water we wish to bind, unites with that carbon atom which is held by three bonds, or which is hydrogenized; the oxygen, on the other hand, unites with the non-hydrogenized carbon atom.

In symmetrical hydrocarbons, on the contrary, the elements of water divide themselves evenly on both sides of the triple bond. (*Ber. d. ch. Ges.* 1884. 13.)   J. H. S., Jr.

Researches on Secondary and Tertiary Azo-Compounds.
R. MELDOLA.

By the action of diazoparanitrobenzene upon a solution of dimethylamine hydrochloride, the author obtained paranitrobenzine-azodimethylamine hydrochloride. The properties of the free base and of the corresponding amido-base are described. The latter furnishes an exceedingly delicate test for nitrous acid, preferable in some respects to the test with metaphenylenediamine.

The constitution of the base may be written

$$NH_2 \left\langle \underline{\quad} \right\rangle N{=}N \left\langle \underline{\quad} \right\rangle N \ (CH_3)_2.$$
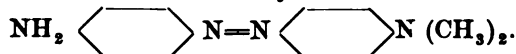
The remainder of the paper is devoted to a study of the action of diazotized metanitraniline upon primary, secondary and tertiary monamines. (*J. Ch. Soc.* CCLVI., 106).   A. A. B.

Studies on the Hydrocarbons and Higher Alcohols Obtained from American Petroleum. G. LEMOINE.

A detailed report of the results of experiments on octylic, nonylic and decylic compounds, confirmatory of those of MM. Pelouze and Cahours. (*Bul. Soc. Chim.* XLI. 161.)   E. W.

Russian Chemical Society. Correspondence of M. O. DAVIDOFF.

M. Gustavson, by treating the volatile portions of petroleum with bromine in the presence of aluminum bromide obtained crystalline bromine derivatives C_6Br_6 and C_6Br_5, CH_3.

The process permits the detection of aromatic compounds in the presence of large amounts of paraffins.

M. Sabaneéff describes some combinations of acelytene, vinyl and ethylene.

M. Lwoff gives the results of researches on the action of chlorine on isobulytene. Isobulytene chloride was not detected among the products of the reaction.

M. Danilewski gave the result of examination of albuminoid substances. Myosine is a basic substance. Myosines from different sources have different powers of saturation. They all contain small amounts of calcium, magnesium and phosphoric acid. These may be removed by neutral acids, but the myosine is then transformed into syntonine. Myosine and syntonine have a rotatory power which may be destroyed by the prolonged action of a 1 per cent. solution of HCl. Mysostroine, a weak base, was also found in muscular tissue.

Caseine was found to be a combination of nucleine with prot-albumen. The products of decomposition of albumenoid substances were also studied.   E. W.

M. Ritza gave an account of the properties of the camphor extracted from Lechum palustre. White crystalline solid fusing at 104° to 105°, boiling at 202°. Observed vapor density 8.1. Formula $C_{16} H_{24} O$, or $C_{16} H_{26} O$.

M. Lidoff presented a note on the solubility of aniline in solutions of its salts. A concentrated aqueous solution of the chlorhydrate will dissolve aniline in all proportions.

M M. Lidoff and *Loukianoff* gave a method for the determination of glycerine in alizarine oil.

M. Pelopidas communicated an application of the principles of the periodic system to organic substances. (*Bul. Soc. Chim.*, XLI. 253). E. W.

ANALYTICAL CHEMISTRY.

On the Conversion of Hyposulphites, into Sulphates, by means of Potassium Permanganate. G. BRUGELMANN.

A concentrated solution of potassium permanganate is added to the boiling solution of hyposulphites under examination, until it has assumed a distinct violet color. The excess of permanganate is then decomposed by adding alcohol and the precipitate of $Mn_2 O_3$ is filtered and washed with hot water. The filtrate is heated till all the alcohol has been expelled.

Sodium hyposulphite, on being heated with potassium permanganate, splits up according to the following reaction:

$2 \, K Mn \, O_4 + Na_2 S_2 \, O_3 = K_2 \, SO_4 + Na_2 \, SO_4 + Mn_2 \, O_3.$ The sulphuric acid is then estimated as Ba SO_4. (*Fres. Zeit.* 1884. 41.)
J. H. S., JR.

Remarks on Azotometry. CARL MOHR.

After some remarks the author proceeds as follows:

If an ammonia salt is to be examined, a two per cent. solution of it is made, if on the contrary a fertilizer is to be examined, 5 or 10 g. are taken, and the solution is made up to 100 c. c.

10 c. c. of this solution are allowed to flow into a 150 c. c. flask, containing 50 c. c. of a solution of bromine in sodium hydrate. The evolution of gas follows quietly, without producing much heat, and the results are said to be quite accurate. (*Fres. Zeit.* 1884. 26.)
J. H. S., JR.

On the Estimation of Nitrogen. DR. RUBE.

The author states that he has made about 3,000 nitrogen determinations, using Ruffle's method, and always obtained good results. He attributes the failures reported by others in using this method to improper application of it. (*Fres. Zeit.* 1884. 43.) J. H. S., JR.

Apparatus for Reducing Measured Volumes of Gas to Normal Conditions. U. KREUSLER. (*Ber. d. ch. Ges.* 1884. 29.)

J. H. S., Jr.

Contributions to the Development of the Sprengel Air Pump. C. H. GIMINGHAM.

Perfection in the instrument is only to be attained by a careful regulation of diameter and length of fall tubes employed. The length of the fall tube should be about 39 inches. The most satisfactory results as to amount of mercury used were obtained by a fall tube of 1.8 m.m. diameter, the mercury running at the rate of 100 c.c. in five minutes. For measurement of the vacuum produced, the McLeod guage (Phil. Mag. May, 1874) is used. (*J. Soc. Ch. Ind.* III. 2. 88.)

E. W.

An Improved form of Orsat's Apparatus for Estimation of Oxygen. J. B. C. KERSHAW. ·

The author calls attention to an error incident to the ordinary form of the apparatus, depending upon the difference of level of the absorbing liquid within and without the vessel, and suggests a modification of the apparatus to correct it. (*Chem. News*, XLIX, 73).

A. A. B.

On the Alkaline Reaction of Glass, as·an Error, in Analysis. By U. KREUSLER and O. HENZOLD.

A number of interesting experiments were here made, which clearly prove that water reacts on the various kinds of glass with more or less energy, dissolving enough, in some cases, to produce errors in analysis. (*Ber. d. ch. Ges.* 1884. 34.)   J. H. S., Jr.

Analysis of Pure Wines. R. FRESENIUS and E. BORGMANN. (*Fres. Zeit.* 1884. 44.)   J. H. S., Jr.

On the Estimation of Tartaric Acid in Wine. R. KAYSER.

A statement of some of the errors involved in the estimation of tartaric acid in wines by titration. (*Fres. Zeit.* 1884. 28.)

J. H. S., Jr.

On the Quantitative Spectroscopic Examination of Different Samples of Pure Indigo. C. H. WOLFF. (*Fres. Zeit.* 1884. 29.)   J. H. S., Jr.

The Hygrometer in the Desiccator. DR. E. FLEISCHER.

The author finds that calcium chloride is not as good an absorbent of moisture as has been supposed, and also finds from hygrometric experiments that sulphuric acid will not only absorb more moisture, but will do so four times as rapidly as calcium chloride. (*Fres. Zeit.* 1884. 33.) J. H. S., JR.

On Some Improvements in the Estimation of Tannins. H. R. PROCTOR.

The principal modification (Loewenthal's method) consists in the addition of a small amount of pure kaolin to the solution containing the tannate of gelatine in suspension, with vigorous agitation. Thus treated, the precipitate filters readily without necessity for tedious waiting. The author prefers to express the percentage of tannic acid in terms of oxalic acid.

Oser's number for quercitannic acid (62.36) is not very far from the molecular weight of oxalic acid (63), and he considers it preferable to employ a standard which may be readily verified. (*J. Soc. Ch. Ind.* III. 2. 82.) E. W.

On the Existence of Phosphoric Acid in Ammonium Molybdate. M. RUPFFERSCHLAGER.

It is noted that phosphoric acid has not been recognized as a constituent of any of the molybdenum minerals except in one case.

The yellow precipitate which frequently forms in the molybdate reagent is not the phospho-compound.

The reagent as usually made is too highly concentrated. The formula given by Fresenius is considered satisfactory. (*Bul. Soc. Chim.* XLI. 172.) E. W.

On a New Qualitative Method of Separating Tin, Antimony and Arsenic. By EMIL BERGLUND.

This process is based upon the fact that the sulphides of tin, antimony and arsenic, on being boiled with oxide of copper in an alkaline solution, lose their sulphur and pass over into the corresponding oxygen-compounds. Thus stannic sulphide in caustic soda solution is oxidized to stannic oxide.

In a similar manner antimony trisulphide and arsenic trisulphide are oxidized respectively to antimonic and arsenic acids.

(*Ber. d. ch. Ges.* 1884. 95.) J. H. S., Jr.

An Alcohol Lamp with Constant Level.   C. REINHARDT. (*Fres. Zeit.* 1884. 40.)   J. H. S., JR.

On the Numbering of Porcelain Crucibles.   C. REINHARDT.

The author numbers the crucibles with a mixture composed of silica, litharge, boracic acid and some metallic oxide, as chromic oxide, etc., which are finely ground in an agate mortar with a little aniseed or lavender oil. The crucibles, after being painted with this mixture, are gradually heated in a muffle until the color has completely burned in. (*Fres. Zeit.* 1884. 42.)   J. H. S. JR.

Note on the Stability of Hypobromite Solution, and its Use for the Titration of Oils, etc.   A. H. ALLEN.

The results of experiments by boiling or keeping the solution of bromine in caustic soda are given in detail. The conclusions are : 1. The presence of excess of caustic soda greatly increases the stability of hypobromite solutions. 2. Most solutions of brominated soda lose a little of their available bromine by boiling. 3. The solution of bromine in excess of caustic soda solution has, after boiling, all the practical advantages which would be possessed by a concentrated solution of free bromine, not liable to loss by volatilization or change in strength by keeping.

The reaction on first dissolving the bromine is :

$$2 \, Na \, HO + Br_2 = Na \, Br \, O + Na \, Br + H_2 \, O.$$

If the solution is boiled, or is kept some time the following reaction occurs : $3 \, Na \, Br \, O + 3 \, Na \, Br = Na \, BrO_3 + 5 \, Na \, Br.$

The action of HCl on the first solution would be :

$$3 \, Na \, BrO + 3 \, Na \, Br + 6 \, HCl = 6 \, Na \, Cl + 6 \, Br + 3 \, H_2 O.$$
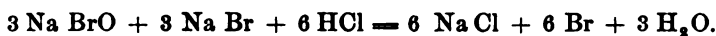
If the transformation into bromate has proceeded with more or less completeness, there is no theoretical loss of available bromine, the reaction being

$$Na \, BrO_3 + 5 \, Na \, Br + 6 \, HCl = 6 \, Na \, Cl + 6 \, Br + 3 H_2 O.$$
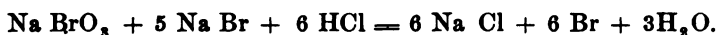
A peculiar fact was observed, viz., that the bromine found in the brominated soda by titration was always slightly in excess of the proportion actually used by weight. In the discussion it was suggested that a new determination of the atomic weight of bromine was desirable. (*J. Soc. Ch. Ind.* III. 2. 65.)   E. W.

Determination of Fat Acids in Oils. CH. E. SCHMITT.

FERMENTATION in oils causes fat acids to separate from glycerine. This is notably the case with oleic acid. Fat acids are not objectionable for soap making or wool cleaning, but they are very much so for machinery, as they act on metals in the same manner as mineral acids, although less violently.

The only process now used is that of Burstyn. It is based on the property possessed by strong alcohol of dissolving fat acids, while neutral fats are not perceptibly soluble.

The operation consists in shaking up 100 grammes of the oil with 100 grammes of alcohol 95%. The shaking should be energetic and often repeated. After settling for some hours, the alcohol, with the fat acids in solution rises to the top. This alcohol is separated ; 20 c.c. are taken with a pipette and tested by a standard alkaline liquid. The acid obtained corresponds to sulphuric acid. This is multiplied by 5, which gives the quantity of oleic acid, as this acid generally predominates.

A controversy having arisen about oil purchased by a house in Lille, the author was led to examine Burstynn's process.

ᷓ A volume of the alcoholic solution of fat acids equal to 20 c.c. was evaporated in a stove at 100° to 105° C, until the weight becomes constant. The following oils were examined :

	Burstyn's Process.	By Weight.
Sweet Almond Oil	0.37	0.28
Pure Olive "	0.514	0.600
Acid Olive "	6.83	6.
" " "	9.23	10.15
" " "	12.70	13.
French Rape Seed Oil	0.85 to 0.90	0.65 to 90
Bombay " " "	0.75	0.25
Dunkirk Codfish "	0.677	0.422

The process of Burstyn gives results which may be considered satisfactory. Alcohol dissolves volatile acids which are lost by evaporation, and also coloring and odorous substances which have no action on an alkaline solution. The influence of volatile substances is to give gravimetric results lower than those by Burstyn's process, while coloring and odorous substances tend to give higher results as they have no action on the standard alkaline solution.

Turmeric gives better indications with fat acids than either litmus or phenolphthalein.   (*Mon. Scientifique.* 3. XIV. 205.)

<div align="right">P. C.</div>

The Separation of Benzine, Toluene and Xylene from Crude Gas Tar, Naphtha and Crude Gas Benzines.   J. von HOHENHAUSEN.

The method for testing the crude product is given as follows : In a flask of 500 c.c. capacity fitted with a stopper carrying both a stop-cock funnel and a safety tube, are placed 100 c.c. of the benzine to be tested, and a cold mixture of 150 gms. nitric acid (80° Tw), and 200 gms. sulphuric acid (170° Tw), are gradually added, the temperature of the mixture being kept down by using cold water on the outside, and regulating the addition of the acids.   Constant shaking is necessary to insure the reaction, and this must be kept up after adding all the acid until the contents of the flask are cold. After separating the acid and washing with dilute caustic soda, and finally with water, the amount of nitrobenzine obtained is determined.

This product may be further tested as follows: 100 c.c. are placed in a retort, and after distilling off about 98 per cent., the residue should still be liquid. The first 30 c.c. distilling over is treated with 70 c.c. of sulphuric acid (of 170° Tw), when all the nitrobenzine dissolves, and the non-nitrated hydrocarbons will separate.   These should be again treated with the nitro-sulphuric acid mixture, when there is a rise in temperature, if any benzine remains.   After all the benzine has been converted into the nitro-compound, the hydrocarbons undissolved by concentrated sulphuric acid may be separated and determined.

The different forms of apparatus (Vedle's toluene apparatus, Egrot's system and Vedle's system) for the refining of commercial benzine are described, the description being illustrated by cuts.   (*J. Soc. Ch. Ind.* III. 2. 73.)

<div align="right">E. W.</div>

On the Quantitative Determination of Ortho-Meta-and Paraxylene.   I. LEVINSTEIN.

The boiling points of these hydro-carbons are :

<div align="center">

Orthoxylene _____ 141° – 142°c.

Metaxylene _____ 140° – 141°c.

Paraxylene _____ 136° – 137°c.

</div>

Fractional distillation cannot be used to separate these.

The metaxylene is the only one possessing at present any techni-cal value.

A. *To Determine Metaxylene.*—Take 100 cc of the crude sample, heat at 100°C with 40 c.c. nitric acid (80° Tw), and 60 c. c. water, for half an hour, or until red fumes are no longer evolved, keeping the mass well mixed. Separate the hydrocarbons from the acid, add ex-cess of caustic soda, and distill with wet steam. The hydrocarbons distilling over consist of metaxylene and some of the paraffines. On separating these hydrocarbons from the water, and mixing with about 1½ times their volume of concentrated sulphuric acid, the metaxylene dissolves by stirring for about half an hour, leaving the paraffines. Measurement of the amount of hydrocarbons be-fore and after the sulphuric acid treatment gives the proportion of metaxylene. The nitric acid treatment, converts the ortho- and paraxylene into compounds soluble in caustic soda, while the metaxylene is unaffected.

A liberal washing with caustic soda may be substituted for the distillation.

B. *To Determine Paraxylene.*—Treat 100 c.c. of the crude xylene with 120 c.c. sulphuric acid (of 170° Tw), and mix for about half an hour. Paraxylene and paraffines remain undissolved. Separate and measure these. Dissolve out the paraxylene by addition of an equal volume of fuming sulphuric acid, and heating on the water bath for a short time. Separate and measure the paraffines and determine the paraxylene by difference as before. Pure paraxylene may be obtained from this mixture with the paraffines by distilling with wet steam. The first portions coming over contain the paraxylene ; dis-till these again with dry heat, collecting all that comes over up to 138°C; crystallize out by a freezing mixture, and press the crystals between filter paper.

C. *To Determine Orthoxylene.*—The amount may be estimated approximately by deducting from 100 the sum of the percentages of paraffines and meta- and paraxylene.

For a closer determination convert the ortho and metaxylene-sulphuric acids obtained in B into their calcium, and afterwards into their sodium salts. Concentrate the solution of the latter until the large prisms of ortho-salt begin to crystallize out. Allow to cool and separate a second crop of crystals by further concentra-

tion ; redissolve and recrystallize the products. The distinction between the crystals of the ortho and of the meta- salt is easily perceived. The ortho- salt has the composition :

$$C_6 H_3 (CH_3)_2 . SO_3 Na + 5 H_2 O.$$
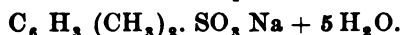
In determinations of boiling points the thermometer was immersed in the liquid, the bulb being about half an inch from the bottom of the retort. (*J. Soc. Ch. Ind.* III. 2. 77.) E. W.

INDUSTRIAL CHEMISTRY.

On the Disposal of Sewage Sludge. C. C. HUTCHINSON.

By "sewage sludge" is meant the slimy mud deposited or depositable from sewage, the solids consisting in large proportion of organic matters containing 90 to 95 per cent. of water. The method described by the author consists in filtration of the sludge by filter presses of special construction. The press cakes thus obtained still contain about 50 per cent. of water, are inodorous, easily handled, and dry rapidly down to about 20 per cent. of water. A mixture of equal parts of aluminium and calcium sulphates is used as a precipitant before filtering the sludge. The press cake is fully equal to farm yard manure as a fertilizer. At Coventry, where a plant such as is described has been in operation for $2\frac{1}{2}$ years, the cost is sixpence per ton of wet sludge, or half a crown per ton of pressed cake. The air-dried pressed cake is sold at from two shillings to three and sixpence per ton. The place contains a population of about 45,000, and 476 tons of wet sludge are treated daily.

In reply to a question the author stated that about five-sixths of the nitrogenous matter in the sewage passed away in the effluent, while about one-sixth remained in the sludge.

The press cake (50 per cent. water) contained 0.84 per cent. ammonia, and 1.81 per cent. phosphate of lime. (*J. Soc. Ch. Ind.* III. 2. 41.) E. W

The Porter-Clark Process. J. H. PORTER.

Description, with illustration, of the plant for this method of softening water. Lime water is mixed with the water to be softened and the mixture is passed through filter presses. At the London and Northwestern Railway locomotive sheds at Camden 7,000 gallons

of water are treated per hour, the hardness being reduced from 17°
or 18° to 4°. Other results are quoted where the hardness is re-
duced from over 20° to 4° or less.   (*J. Soc. Ch. Ind.* III. 2. 51.)

<div align="right">E. W.</div>

Note on the Printing of Natural Indigo on Calico. R. Bourcart.

Description of the plant, with plans and illustrations, and of the
processes used by Messrs. Schlieper & Baum, of Elberfeld. The
process depends upon the reducing action of glucose, in presence of
alkalies, at 100°C upon indigo. The color, which is made very
thick for printing, is a mixture of indigo paste, caustic soda, and of
mixed roasted and unroasted Indian corn-starch. The cloth is pre-
viously padded in a solution of glucose, and dried, the color is
printed on, and the goods are then steamed, which causes the soda
to dissolve, and brings the indigo in contact with the glucose. After
thorough washing, the goods are dried and oxidized at the same
time, and finally brightened by boiling with a weak solution of
caustic soda, which is more satisfactory than a soap bath. Speci-
mens are inserted in the text, showing the results with "printed
indigo." "indigo printing on turkey red cloth," "indigo and sulphur
resist," "white and yellow resist with indigo," "white and red
mordant resist," and "half resist." The use of artificial indigo
is not favored by the author, on account of the unpleasant odor
of the sodium xanthate used, which is persistently retained by the
goods. (*J. Soc. Ch. Ind.* III. 2. 55.)   E. W.

Influence of Plaster of Paris on the Composition and Chemical Characters of Wine. M. Magnier de la Source.

Ten kilogrammes of grapes were divided into two equal portions.
One portion was allowed to ferment without the addition of any
foreign body, while the other portion had 100 grammes of sulphate
of lime added. The fermentation of both were finished in twenty
days.

These two wines differed by their chemical characters, as shown
by their reactions with borax, basic lead acetate, and aluminium
acetate.

The color of the natural wine was yellowish, while the plastered
wine was of a pure, bright red. Cream of tartar was present in the
natural wine (nearly 2 %) but there was none in the plastered wine.
(*Comptes Rend.* XCVIII. 110.)   P. C.

Presence of Diamonds in a Pegmatite from Hindustan. M. CHAPER.

In Griqualand diamonds are found in a rock but it is doubtful whether this consolidated, serpentinous mud is the bed-rock of diamonds. At any rate, diamonds are not found in their bed-rocks either in India or in Brazil.

The author has had the good fortune to find diamonds associated with corundum in a pink pegmatite from the Naizam, in the neighborhood of Bellary, presidency of Madras.

The diamonds are in octahedra. (*Comptes Rend.* XCVIII. 113.)

P. C.

On the Influence of the Temperature of Distillation on the Composition of Coal Gas. L. T. WRIGHT.

An account of experiments with a small gas-making apparatus, in which, with all parts complete as in actual work, a charge of only $\frac{1}{1000}$ of a ton was used.

The influence of increasing temperature is shown by a series of analyses representing the composition of the gas made from four charges, each worked at a different temperature, the temperatures ranging from dull red to bright orange heat. Volume of product increases with temperature, and illuminating power decreases, although there is a slight increase in total candle power per ton of coal with increasing temperature.

H and CO increase with temperature, CH_4 and other hydrocarbons decrease, while N is nearly constant at all temperatures. The effect of increased duration of heating is similar to that of increased temperature. (*J. Ch. Soc.* CCLVI. 99). A. A. B.

Gaseous Fuel Applied to the Heating of Gas Retorts. C. HUNT.

Descriptions are given of different systems for regenerative heating of retorts. Regeneration without recuperation (heating of the air) cannot be made satisfactory. Uniformity of temperature throughout the setting is an important point. In recuperation, the use of the thinnest material, consistent with strength and durability, and long contact both for air and waste heat, must be secured. As to forms of producers, there is a great difference of opinion. For economy and convenience the generator should form a part of the

construction of the setting. The saving in fuel effected by the systems now available amounts to between 20 and 40 per cent. and upward. The question of the value of by-products is, however, one which has to be considered by gas companies in considering the question of the adoption of the regenerator system. The intensity of heat obtained by some systems has caused trouble in the clogging of the stand pipes or the hydraulic main.

It is suggested that the production of gas for distribution as fuel at cheap rates may be much nearer realization than is suspected by many. (*J. Soc. Ch. Ind.* III. 2. 89.) E. W.

Coal Gas as a Labor-saving Agent in Trade. F. FLETCHER.

A lecture delivered before the Society of Arts, Jan. 30, 1884, in which an extended description is given of new forms of burners and new applications of gas for heating purposes. (*Chem. News*, XLIX, 74). A. A. B.

An Attempt to Utilize Waste Heat by Perkin's Pipes. F. HUETER.

The attempt in the case described resulted in failure, although seems probable that with some modifications in the system adopted, success might be attained. (*J. Soc. Ch. Ind.* III. 2. 67.) E. W.

On Lilienfein's Lamp, for Low Boiling Petroleum. DR. UNECH. (*Fres. Zeit.* 1884. 35.) J. H. S. JR.

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Abstracts of American Patents relating to Chemistry.

BY O. H. KRAUSE.

January 22, 1884.

292,286.—Process of mixing and consuming hydrocarbons with pulverized earth.—J. Leede.

292,287.—Apparatus for feeding and consuming fine fuel.

·The hydrocarbons are mixed with granular material or pulverulent fuel and the mixture blown into a furnace and burned while in suspension.

292,260.—Utilizing waste calcium chloride and sulphate produced in the manufacture of acetic acid from acetate of lime.—U. Semper. Not intelligible without the specification.

292,269.—Composition for sizing yarn. J. W. Wattles (see also Nos. 186,485 and 172,216). A sizing or dressing composed of acetic acid, starch and grease or oil.

292,341.—Purification of coal gas.—J. T. McDougall. ·Impregnates saw-dust, tanners' waste or other light material with a soluble salt of iron, decomposes the salt by an alkaline reagent whereby oxide of iron is deposited in the pores of the material which can then be used for the purpose stated above.

292,394 and 292,395.—Gas producers.—J. Zellweger.

292,417.—Apparatus for refining asphaltum for paving.—E. J. De Smedt. The fumes and gases evolved from the heated asphaltum contained in covered melting kettles are withdrawn by means of an ejector and burned under a steam boiler.

January 29, 1884.

292,470.—Fertilizer.—D. R. Castleman. Ground tobacco stems and ordinary phosphates.

292,515.—Photometer.—T. O'C. Sloane.

Claim 2.—In an apparatus for determining the illuminating power of gas, a differential thermometer constructed as described, and balanced and arranged so as to indicate changes in the relative quantity of radiant heat developed by a flame of gas, and transmit such changes to a recording mechanism substantially as shown and described.

292,540.—Process of tinning sheet copper.—A. A. Cowles. Protects side not intended to be tinned with silicate of soda.

292,605.—Art of extracting gold by means of alkaline sulphides.—C. P. Williams.

Heats the gold bearing material with carbon and an alkaline sulphate, leaches the cooled mass with water to dissolve out the sulphides from which the gold is recovered by precipitation.

292,622.—Apparatus for producing gas.—G. W. Billings.

292,669.—Process of solidifying liquid or semi-liquid fatty acids.—W. F. C. McCarty.

· Improvements on Nos. 282,547 and 288,003. Obtains a product of high melting point by successively treating liquid or semi-liquid fatty acids with steam, air, nitric acid, starch, alkalies and sulphuric acid. The mixture is continuously agitated and heated and cooled at different stages of the process. The product is finally distilled in a vacuum.

292,696.—Apparatus for the manufacture of carbon black.—G. G. Shoemaker.

Liquid fuel is burned under rotating hollow cones kept cool by means of water distributed over their outer side.

292,758.—Process of making spongy lead for the manufacture of white lead.—J. K. Kessler. Passes an electric current, by means of a lead anode, through a solution of an alkaline acetate.

February 8, 1884.

292,788.—Apparatus for deoxidizing iron ores.—J. Bridgford.

292,891.—Process of treating fibrous rubber waste.—A. O. Bourn.
The cotton fibre is destroyed by boiling the chopped waste in a 3 or 4 per cent. solution of sulphuric acid.

292,944.—Desulphurizing furnace.—H. E. Parson and G. V. Northey.

292,980.—Soap.—C. F. Broadbent.
Consists of ordinary soap, water, hyposulphite of soda, borax and ammonia.

293,002.—Roasting furnace.—N. A. Foss and J. M. Gray.

293,010.—Building compound.—L. Haas. Furnace slag and mortar combined in suitable proportions with an additional cementing mortar made of powdered flint, sodium silicate, sand and clay.

293,023.—Coking furnace.—A. R. Hiltawski.

293,045.—Mixed Paint.—H. Little. Coal tar thinned by a light oil and wood ashes.

293,107.—Gas-retort furnace.—I. N. Stanley.

293,157.—Process of roasting and amalgamating gold and silver ores.—E. O. and C. Francke.
Consists in salting and roasting the same at a low temperature for conversion of certain sulphides into sulphates without disturbing other metallic salts, and afterward treating the same in a pulp with common salt and quicksilver, under the influence of heat and in the presence of metallic copper, whereby, through a series of reactions, the silver is reduced to a metallic state and amalgamated.

298,207.—Artificial stone.—R. C. Wittmann.—Carbonate or silicate of magnesia, carbonate of lime and muriatic acid, applied to pasteboard, wood, muslin, etc., and pressed.

February 12, 1884.

298,385.—Vacuum press percolator.—C. R. Knapp.

293,844.—Process of extracting glycerine from fatty matters.—E. F. and E. N. Michaud. Consists in placing the fatty matters, with water and a zinc preparation (known as "zinc-powder" and consisting, principally of finely divided metallic zinc and zinc oxide), and in the absence of calcareous or alkaline substances, in a closed vessel, subjecting the same to steam pressure for a sufficient time, and separating the water containing the glycerine from the resulting fatty acids.

298,876.—Process and apparatus for bleaching vegetable fibres, threads and fabrics.—J. B. Thompson.

First boil them in a solution of potassium or sodium cyanide, then subject them to alternate baths of a solution of chloride of lime and of carbonic acid gas in a closed vessel, and lastly passes them through a solution of triethylrosaniline and oxalic acid.

298,409.—Defacating saccharine liquids.—G. B. Boomer.

A train of vessels closed at the top and provided with heating mediums and so connected with adjustable overflow spouts that the clear liquid can be withdrawn from a point below the scum at the top and the sediment at the bottom.

298,430.—Apparatus for revivifying boneblack.—E. P. Eastwick.

The coolers under the kiln are surrounded by a casing for the purpose of confining a current of air. The heated air thereby obtained is forced by means of a blower through the wet boneblack contained in the drier placed over the kiln.

298,560.—Hydrocarbon furnace.—W. H. Brooks.

February 19, 1884.

298,740.—Method of purifying water.—I. S. Hyatt.

Consists in introducing into the water simultaneously with its passage to or into the filter, a substance (see next patent) which will sufficiently coagulate or separate the impurities to facilitate their arrest and removal by the filter bed, thus obviating the necessity of employing settling basins.

293,741.—Filtering material.—I. S. Hyatt.

Claim.—A filter bed, consisting essentially of an inert material and metallic iron in comminuted form thoroughly commingled.

293,742 to 298,750 and 298,882-888.—Filters and art of filtration.— J. W. Hyatt.

Various substances employed in different ways are claimed for mechanically retaining the impurities contained in water. Also arrangements to prevent clogging and to remove the deposited impurities without disconnecting the apparatus.

293,782.—Apparatus for evaporating and clarifying syrups.—D. D. Powers.

Consists in passing streams or jets of heated and ordinary air alter nately through the material.

293,827.—Alloy and process for the manufacture of silicious copper and silicious bronze.—L. Weiller.

Claim 1.—Sodium bronze as a new combination of matter.

Claim 4.—In the manufacture of silicious bronze, the improvement con-sisting in adding tin and sodium together with potassium fluosilicate to the melted copper or bronze.

293,838.—Process and apparatus for extracting crystallized sugar from bagasse.—T. B. Yale.

Consists in subjecting the crushed saccharine material in a closed vessel to the action of steam, and then extracting the juice and dissolved crystallized sugar from the saccharine material by means of a vacuum.

293,854.—Apparatus for the manufacture of illuminating gas.—W. H. Douglass.

A hydrocarbon gas generator.

293,884.—Condenser-scrubber for gas.—C. W. Isbell.

Causes both the gas and the scrubbing liquor to pass in contact with ar-tificially cooled surfaces.

293,886.—Alloy for coating metals.—J. B. Jones.

Consists of lead, tin and zinc, with metallic sodium added.

293,909.—Process and apparatus for preparing beer and other fermented liquids for the market.—C. Pfaundler. Consists in holding such beer or other liquid during fermentation under a controllable hydrostatic pressure and carrying off the barm which rises from the fermenting mass by a cur-rent of liquid.

293,936.—Amalgamator.—T. H. Becker.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Regular Meeting, April 4th, 1884.

President James C. Booth occupied the chair.

The minutes of the March meeting were read and approved.

The minutes of the meeting of the Board of Directors on March 18th were read.

The following gentlemen were then unanimously elected regular members of the Society :

Morton Liebschütz, 345 Westh 34th street, New York.

Edmund Baujard, 2 West 14th street, New York.

Resignations were accepted from

Alfred S. Beebe, Ph. B.; and

Herman T. Vulte, Ph. B.

The following papers were then read :

1. On the Spectroscopic Examination of Azo-Colors (1st paper), by J. H. Stebbins, Jr. Discussion by Dr. Alsberg and Mr. Casamajor.

2. On the Use of Tubes of Colored Glass for Nesslerizing, by A. A. Breneman. Discussion by Mr. Casamajor and Dr. Leeds.

3. On the Analysis of a Mineral Water, containing Manganese and Cobalt, from a spring at Irondale, West Virginia, by A. A. Breneman. Remarks by Dr. Booth.

Mr. Casamajor read a letter written by himself to Prof. Hofmann, in presenting the Hofmann medal, and the reply of Prof. Hofmann to the same. Moved by Dr. Leeds, that both letters be published in the Journal; the motion was seconded by Dr. Alsberg and carried.

Dr. Doremus, of the Committee on Papers and Publications, explained an error of the printer in omitting from the number of the Journal for August, 1883, certain papers which should have appeared therein, and which were referred to in the index published in that number.

Prof. Breneman moved that the Committee of Five on an Uniform System of Nomenclature and Notation proposed at the March meeting, include the Chair, Dr. Leeds, as one of its members ; seconded by Mr. Casamajor, and carried.

The meeting then adjourned.

<div style="text-align:center">

CHARLES E. MUNSELL,

Recording Secretary.

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ADDITIONS TO THE LIBRARY OF THE AMERICAN CHEMICAL SOCIETY,

DURING MARCH, 1884.

Presented by the Author.

Presented by W. B. Phillips, Ph.D.:

"Report on North Carolina Phosphates" (pamphet).

Acquired by Gift.

Presented by Prof. A. R. Leeds :

Thorpe, T. E. "Quantitative Chemical Analysis," 4th ed. 1884.

Presented by the American Institute of Mining Engineers:

Kimball, Dr. J. P. "Differential Sampling of Bituminous Coal Seams" (pamphlet).

Durfee, W. T. "An Account of a Chemical Laboratory Erected at Wyandotte, Mich., in the year 1863" (pamphlet).

Dewey, F. P. "Some Canadian Iron Ores" (pamphlet).

Frazer, Dr. Persifor. "The Northern Serpentine Belt in Chester Co., Pa." (pamphlet).

——————————. "The Peach Bottom Slates of Southeastern York and Southern Lancaster Co." (pamphlet).

Gordon, F. W. "Boilers and Boiler Setting for Blast Furnaces" (pamphlet).

Smock, J. C. "Geologico-Geographical Distribution of the Iron Ore of the Eastern United States" (pamphlet).

Fulton, John. "The Physical Properties of Coke as a Fuel

for Blast Furnace Use " (pamphlet).

Egleston, T. "Biographical Notice of Louis Gruner, Inspector General of Mines of France" (pamphlet).

Clemes, J. H. "An Experimental Working of Silver Ores by the Leaching Process" (pamphlet).

Howe, H. M. "A Systematic Nomenclature for Minerals" (pamphlet).

Forsyth, R. "The Bessemer Plant of the North Chicago Rolling Mill Co., at South Chicago" (pamphlet).

Presented by the Bureau of Education, Washington, D. C.:

Circular of Information, No. 3, 1883.

"Proceedings of the Department of Superintendence of the National Educational Association at its Meeting at Washington, Feb'y 20–22, 1883."

Circular of Information No. 4, 1883.

"Recent School Law Decisions."

"The Bufalini Prize" (pamphlet).

"Education in Italy and Greece" (pamphlet).

THE HOFMANN MEDAL.

To the Editor of the Journal of the AMERICAN CHEMICAL SO-
CIETY.

My Dear Sir:—Please find herewith copies of a letter written
by me to Dr. A. W. Hofmann and of his answer.

The subject of this correspondence was a beautiful gold medal,
struck at the United States Mint in Philadelphia. On the obverse
the medal bears an excellent effigy of Dr. Hofmann, while on the
reverse is following inscription : "To A. W. Hofmann—From his
friends and admirers in the United States of America—October,
1883."

There were 44 subscribers to the medal, of whom 28 were mem-
bers or associates of the American Chemical Society. As all the
larger sums, with one exception, were contributed by these, more
than three-quarters of the funds came from members of this So-
ciety.

It is almost useless to say that these 44 subscribers represent only
a very small portion of Dr. Hofmann's admirers in this country.
As the sum needed was a limited one, only a comparatively small
number of persons could possibly contribute.

The thanks of the subscribers to the medal are due to Dr. James
C. Booth, Chemist of the Philadelphia Mint, and now serving a
second time as President of the American Chemical Society, for
his untiring zeal and earnest efforts in supervising the execution of
this beautiful work of art.

With much respect,
                    I am yours very truly.
                              P. CASAMAJOR.

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117 WALL STREET, NEW YORK, February 12th, 1884.

DR. A. W. HOFMANN, *University of Berlin, Berlin, Germany.*

Sir:—Your friends and admirers in the United States of America,
wishing to testify their appreciation of the services you have ren-
dered to the world by your labors in chemical science, and espe-
cially to organic chemistry and its unlimited applications to the
useful arts and being desirous, moreover, of commemorating your
visit to their country in the year 1883, and of expressing their

sense of the privilege they enjoyed in personal intercourse with you in October of that year, have caused to be struck at the United States Mint, in Philadelphia, a gold medal, which they ask you to accept in confirmation of the sentiments expressed above.

You will receive, at the same time, a bronze copy of the medal, like those which the subscribers to the gold medal receive.

With much respect, I am your obedient servant,

<div style="text-align:center">(Signed.)   P. CASAMAJOR.
(For the subscribers.)</div>

(Inclosed was an alphabetical list of the subscribers.)

<div style="text-align:center">BERLIN, 10 DOROTHEA STRASS, March 10, 1884.</div>

My Dear Sir :—When a happy combination of circumstances, in the Fall of last year, brought about the fulfillment of a wish long and fervently cherished, the expectations—accumulated as it were during a lifetime—with which I crossed the ocean, were by no means limited. But what I observed and what I learned in America, how far did it surpass even my boldest expectations ! From the moment I first saw the transatlantic metropolis arise from the waves, to the parting hour when I had to take leave again of your glorious country, overwhelming impressions crowded upon me which forever will remain treasured up in my memory. Moreover, during the whole of my stay on the hospitable soil of America, whilst traversing the great continent from the Atlantic to the Pacific ; whilst descending from the new Territories in the Northwest to the Gulf of Mexico; whilst visiting the great cities in the East, though often bewildered by the great current of American life, in its endless diversity, I have experienced a uniformity of kindness for which I cannot be thankful enough. Foremost, however, among those whose cordial good will and helpful advice assisted my progress through the States, were always my brethren in science, my fellow-workers in the field of chemistry, and indeed the most delightful recollections which I have carried home from the New World are those of the friendly intercourse with my transatlantic colleagues, which in the great convivial farewell gathering under the auspices of the American Chemical Society found its most eloquent expression.

And now whilst indulging in these charming remembrances, with all the amiable attentions of my American friends still fresh before my mind, I receive your message informing me of the new and most conspicuous honor which they have conferred upon me. I am quite at a loss how to express my thankfulness, for this exceptional distinction is utterly out of proportion with any merit I could possibly claim.

It is true I have devoted my life to the cause of science, but less fortunate than some of my fellow-soldiers, I have to record no victories won in its service worthy to be commemorated by a medal. My labors have been of a more modest kind and by the blessing of having been permitted to prosecute the studies of my predilection for a period of forty years, I considered myself amply rewarded.

I need not assure you, however, that although somewhat perplexed by the monumental form which the feelings of good fellowship of my American friends and their indulgent appreciation of my life-work has taken, I am deeply touched and feel myself honored in the highest manner by the solid and permanent token of their sympathy.

Pray convey to those who have conferred upon me this signal mark of their approbation the expression of my heartfelt gratitude.

The gift of honor I have received will descend an inalienable heirloom in my family.

<div style="text-align:center">(Signed.)　　A. W. HOFMANN.</div>

To P. CASAMAJOR, ESQ.

ON THE SPECTRA OF AZO-COLORS.

By J. H. Stebbins, Jr. (1st paper, April 1st,' 84.)

Much has already been done and said on the spectra of aniline and other dyestuffs, but up to the present time, I think nothing whatever has been done, bearing on the subject of azo-colors.

With the view, therefore, of throwing some light on this subject, and as a further means of distinguishing these colors, one from another, I have undertaken this investigation.

As the collecting of the different samples of dyestuffs is a somewhat troublesome matter, I shall only be able to read to you to-night the first part of my paper, reserving the second part, until the material on hand will enable me to proceed with it.

The spectroscope used in this investigation is a direct vision instrument, with micrometer scale, and comparison prism, manufactured by Dr. J. G. Hofmann, of Paris. It is a most excellent little piece of apparatus, and admirably suited for the study of absorption spectra.

The solutions examined were contained in wide mouthed, white glass, square bottles, having an inside diameter of 3½ C. M. My method of mapping is very simple and will explain itself. On a Bunsen scale, I lay out the principal Frauenhofer lines, and by means of these and the scale figures locate the position of the spectra. The vertical lines give the intensity of absorption, and the horizontal lines the strength of the solutions. Then, by simply drawing a curve from the horizontal to the vertical lines, the position and intensity of absorption may be expressed.

The azo-colors which I have thus far examined, present no very striking features, there being no characteristic bands as in some other colors (cochineal for instance), but a mere cutting out, so to speak, of the green, blue and violet parts of the spectrum, which varies according to the strength and nature of the color.

The following is a list of the dyestuffs examined :

Orange II and IV, and Fast Red, from the firm of Pickhardt & Kutroff.

Tropaeolines Y O.; OOO Nº 1; OOO Nº 2.

Brown O, Brown N° 1, and Chrysoidine, from the firm of Williams, Thomas & Dower.

Orange 2.

β-Naphtholeazobenzolesulphonate of soda.

$$C_6H_4 \ (Na \ SO_3)—N=N--B—C_{10} \ H_6 \ OH.$$

Dissolved 1 grm. of dyestuffs in 1 litre of water, and examined the spectrum.

It gave a band extending from 50—or D to 170. Region of maximum intensity D 54—H 170.

The same plus sulphuric acid produced no visible change.

Orange IV.

Diphenylamineazobenzolesulphonate of potash.

$$C_6H_4 \underset{\diagdown}{\overset{\diagup SO_3K}{}} \\ N=N—C_6H_4 \ NH—C_6H_5$$
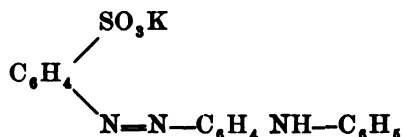
As this is a much stronger dyestuff than the foregoing, it was necessary to work with much more dilute solutions. ¼ grm. was dissolved in 1 litre and examined.

Absorption band ranges from D 60—H 170.

Region of maximum intensity D 62—H 170.

The same plus sulphuric acid gave a band ranging from C 42—H 170.

Region of maximum intensity D 54—H 170.

Fast Red, Roccelline, etc.

β-Naphtholeazonaphthaline sulpho-acid.

$$C_{10} \ H_6 \ (HSO_3)—N=N—\beta\text{-}C_{10} \ H_6 \ OH.$$

⅓ grm. was dissolved in 1 litre and examined.

Absorption band ranging from C 42—H 170.

Region of maximum intensity D 52—H 170.

Sulphuric acid produces no visible changes.

Tropaeoline Y.

Phenoleazobenzolesulphonate of soda.

$$C_6 H_4 (Na SO_3)—N \!\!=\!\! N—C_6 H_4 OH.$$
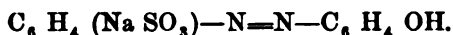
Dissolve $\frac{1}{2}$ g. to 1 litre and examined the spectrum.
Absorption band ranging from E 70—H 170.
Region of maximum intensity E 50—H 170.
The same plus sulphuric acid gave a band from D 50—H 170.
Region of maximum intensity E 70—H 170.

Tropaeoline O. O. O. N⁰ I, or Orange, N⁰ 1.

α-Naphtholeazobenzolesulphonate of potash.

$$C_6 H_4 (KSO_3)—N \!\!=\!\! N—X—C , H_6 OH.$$

$\frac{1}{2}$ grm. was dissolved to 1 litre and examined.
Absorption band runs from C 49—H 170.
Region of maximum intensity 54—170.
Sulphuric acid produces no change.

Tropaeoline O. O. O., N⁰ 2.

Same as Orange N⁰ 2.

Tropaeoline O.

Resorcineazobenzolesulphonate of soda.

$$C_6 H_4 (Na SO_3)—N \!\!=\!\! N—C_6 H_3 \begin{smallmatrix} \nearrow OH. \\ \searrow OH. \end{smallmatrix}$$
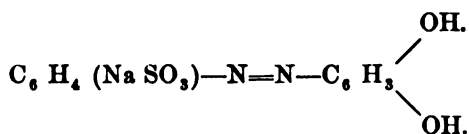
$\frac{1}{2}$ grm. was dissolved in 1 litre and examined.
Absorption band runs from D 65—H 170.
Region of maximum intensity E 70—H 170.
Sulphuric acid produces no change.

Brown O.

$\frac{1}{2}$ grm. was dissolved in 1 litre and examined.
Absorption band runs from D 52—H 170.
Region of maximum intensity D 66—H 170.
Sulphuric acid produces a band ranging from C 48—H 170.
Region of greatest intensity D 54—H170.

Brown N⁰ 1.

¼ grm. was dissolved in 1 litre and examined.
Absorption band ranges from C 40—H 170.
Region of greatest intensity C 44—H 170.
Sulphuric acid seems to produce no change.

Chrysoïdine.

Diamidoazobenzole.

$$C_6 H_5—N=N—C_6 H_3 (NH_2)_2$$

¼ grm. was dissolved in 1 litre and examined.
Absorption band ranges from D 50—H 170.
Point of maximum intensity D 60—H 170.
Sulphuric acid produced no change.

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ard color solutions of known strength.

G H

110   120   G 130   140   150   160   170

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Sulphuric acid seems to produce no change.

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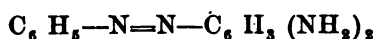
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G · 110 · 120 · 130 · 140 · 150 · H 160 · 170
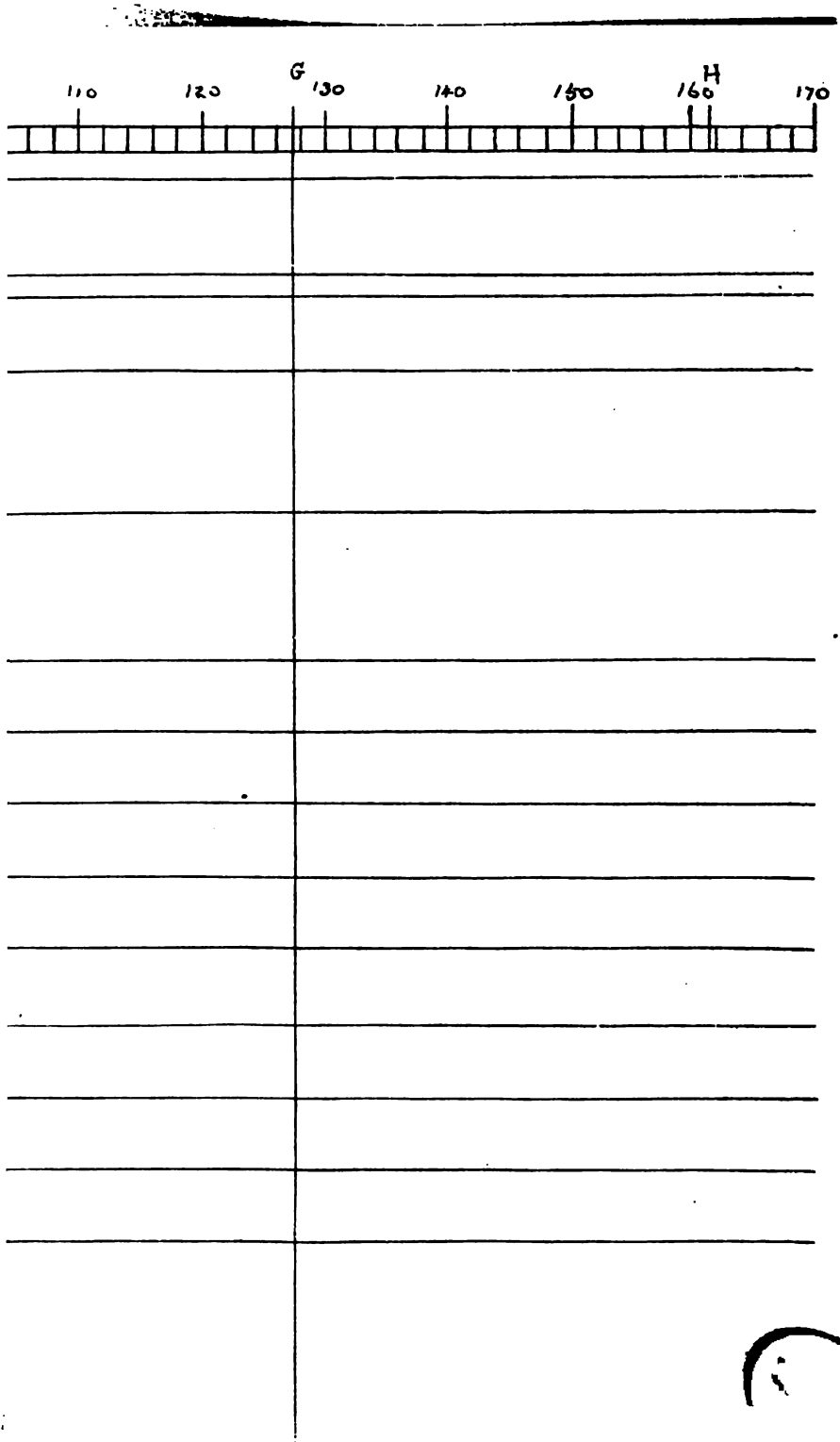
ON THE USE OF TUBES OF COLORED GLASS FOR NES-SLERIZING.

By A. A. BRENEMAN.

The idea of using the ordinary amber-colored window glass of different shades to furnish a series of standard tints for use in the Nessler ammonia test, occurred to me several years ago, and a note upon the subject was read at the Boston meeting of the American Association in 1880. Since then I have found, however, that the suggestion was not essentially new, and the method proposed moreover, that of holding a slip of glass of the desired tint over the mouth of a Nessler test tube filled to the mark with clear water while the tube containing the unknown quantity of ammonia is held by the side of the test tube for comparison, is open to objection. The fact that light coming to the eye after passing through the length of the comparison tube is modified by reflection at the surface of the colored glass, as also the fact that the colored media in the two tubes have their upper surfaces respectively in different planes and at different distances from the eye, both tend to prevent a satisfactory comparison of the two tints. While these difficulties might be corrected, in part at least, by surrounding each tube with a blackened sheath or case, it has seemed more in accordance with the ordinary method of making the Nessler test and with the princi-ples of colorimetry in general, to introduce the colored medium be-low the comparison tube. The light from this colored medium should be applied in connection with a tube precisely like the comparison tube and filled to the mark with clear water; in no other way can the *quality of illumination*, which is essential to a fair comparison, be obtained. The suitability of glass as the colored medium is sim-ply a question of securing the proper tints. Its cleanliness, uniformit and fixity of tint render it far superior to any other substance that could be applied to this purpose. It was mentioned in the note re-ferred to that the tints of commercial amber glass corresponded very well with the higher values needed among the Nessler standards, such for example as the tints given by 1c.c. of Wanklyn's weak so-lution of ammonia (1c.c.=.00001 grm. NH_3), but it was found difficult to obtain glass matching the tints given by smaller quanti-ties of ammonia and for values under 0.5c.c. of the standard solution, no glass of tint sufficiently light could be found. Even " flashed "

glass which might be supposed to yield lighter tints than "pot-colored" glass, is still too dark for the purpose. The manufacture of glass is too costly an operation to permit of experiments being made upon special "batches" of glass made for the purpose, unless some manufacturer could be inspired with a scientific interest in such work, or were given an order large enough to warrant the attempt as a matter of business. Failing in this direction, it occurred to me that a tube made from glass of the proper tint might answer the purpose, and the fact that the bottom of such a tube would be *blown*, suggested the means of varying its thickness, and therefore its tint, to any desired extent. Such a tube was found, however, to be unsuitable for comparison with the color of Nesslerized liquids, because the yellow light coming through the sides of the tube increased the color given to the light coming through the bottom, and even when filled with clear waters the quality of illumination in the two tubes was such as to forbid comparison. The only suitable condition seems to be that in which the light enters the tube through the colored medium placed at or very near the bottom of the tube. The sides of the tube should be of colorless glass, and the tube filled with clear water as mentioned above. These conditions seem to be best fulfilled by such tubes as are shown here, for which I am indebted to the cooperation of a skillful glass-blower, Mr. William Baetz. A short length of amber glass tubing is fused to a longer piece of coloress tubing to form a tube like those used in Nesserlizing. The bottom is flat, and the colored portion forms about one-fifth of the entire tube. It is a matter of some difficulty to find glass of proper composition to adhere readily to the amber glass, and still more so to extend the colored part of the cylinder by blowing without altering its diameter. Both results have been fairly accomplished however, and slight defects shown in these tubes will be removed, no doubt, after practice in making them. It is possible, then, to start with glass tubing of a given shade and to weaken the tint by blowing out the tube until the desired tint is reached. The tube is then closed and flattened at the desired distance from the junction with the coloress glass. In practice I have found it more simple to have a number of such tubes made of various shades below a certain one and to pick out from these such as corresponded exactly with the different values given by the Nessler reagent with known quantities of ammonia. It has been my custom for years in using Wanklyn's method

of water analysis, to distill off 10c.c. at a trial, using only 100c.c. of the water to be tested, and all of these tubes have been made of the 10c.c. size, but the principle is perhaps more easily applicable to larger tubes, because the variations of tints required would be less delicate. For very light shades I have found an amber glass with a barely perceptible olive tint to yield the best results when distended and weakened in color as described. It should be said finally, that the junction of the compound tube causes an unavoidable *ringed* appearance in the tube when filled with water, but with a well-made bottom to the tube there is always a clear space within the innermost circle sufficiently large to permit of comparison with the tint of the other tube.

ON THE ANALYSIS OF A SAMPLE OF MINERAL WATER FROM IRONDALE, WEST VIRGINIA.

BY A. A. BRENEMAN.

I have recently had occasion to examine a sample of mineral water which, as shown by the accompanying analysis, is somewhat peculiar in composition. The water was taken from a spring on the property of Mr. F. Nemegyei, at Irondale, Preston Co., West Virginia. This spring issues near the base of a hill in which beds of bituminous coal alternate with beds of fine clay, limonite and limestone. The coal in some of the veins, especially in the higher part of the hill, is very rich in pyrites.

The water has a faintly acid reaction, and in taste is weakly astringent. Its color is perceptibly yellowish in thick layers.

Analysis yields the following results expressed in grains per U. S. gallon :

Calcium Sulphate	60.417
Aluminium "	11.371
Potassium "	6.764
Magnesium "	4.335
Manganese "	2.857
Ferrous (?) "	0.336
Cobaltous "	Trace
Sodium Chloride	1.361
Silica, SiO_2	1.445
Nitric Acid	Trace
Organic and volatile matter	10.239

Sulphuric acid calculated from the above corresponds to 51.003 grains $H_2 SO_4$ per gallon; a direct determination of sulphuric acid in the same water made for the purpose of control, yielded 50.620 grains.

The composition of this water is accounted for in the main by oxidation of pyrites in the higher parts of the hill and the action of the resulting solutions of ferrous sulphate and free acid upon the beds of fireclay, limonite and limestone through which it percolates subsequently. The comparative freedom of the water from iron is probably due to a secondary reaction taking place between weak solutions of ferrous sulphate and calcium carbonate. The abundance of the organic matter is difficult to account for from any existing evidence. This organic matter is precipitated from the water by ammonia as a reddish, flocculent mass closely resembling ferric hydrate, but on drying and fusion with alkaline carbonate and nitrate it yields only an insignificant proportion of iron. This precipitate, however, contains almost the whole of the manganese present in the water. The trace of cobalt is very decided. A determination of organic matter made in another sample from the same spring taken Feb. 5, 1884, about three months later, yielded 8.257 grains per gallon.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Electrical Conductivity of Dilute Saline Solution. E. BAUTY.

The saline solutions were so weak that their density and their viscosity were practically those of pure water. If p be the weight of salt in the unit of weight of solution, and c the conductivity of a cylinder of liquid of which the length and section are unity, there is, for every salt, a value p, of p, below which conductivity varies proportionately to the quantity of salt in solution. If the conductivity of various salts are examined, they will be found to be inversely as the equivalents. If e be the equivalent, we have :

$$C = K\frac{p}{e}$$

The coefficient K is constant for all salts that have been examined If, in the above formula, $p = e$, *i. e.* if for the same volume of each liquid we take a weight proportional to the equivalents, the conductivity C is the same for all. *The molecular conductivity of all salts is the same.* The following experiments were made with anhydrous salts. Solutions contained $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, $\frac{1}{4000}$ of the salts in solution. Taking potassium chloride as unity, we have had the following results:

Formula of the Salt.	Equivalent.	Values of r for solutions.				p.
		$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$	$\frac{1}{4000}$	
NH⁴ Cl	53.5	0.743	0.73	0.724	......	0.718
K Cl	74.5	1.000	1.000	1.000	1.000	1.000
NH⁴, NO⁵	80	1.203	1.134	1.156	1.133	1.074
K O, SO³	87	1.507	1.338	1.257	1.182	1.169
K Br	119	1.473	1.536	1.531	......	1.597
K I	166	2.132	2.202	2.108	......	2.233

Similarly, values are given for seven other salts, and another table follows with results given by hydrated salts.

In the discussion M. Berthelot called attention to the importance of these results. According to the new law, electrical resist-

ance in dilute solutions is determined by the chemical equivalents and not by the atomic weights. Faraday's law also is. relative to equivalents and not to atomic weights. Equivalent weights are then the foundation of electro-chemical laws, as well as of all physical laws in which the relative weights of bodies play a part. All of these laws become more obscure and more complicated when expressed by means of atomic weights. (*Comptes Rend.*, *XVCIII*, 140.)   P. C.

On Skrivanow's Battery—Pocket Model. D. MOUNIER.

The elements are a zinc plate and silver chloride wrapped in parchment paper. The liquid has potassium hydrate, 75 parts water, 100. The trough is made of gutta percha, and hermetically closed. The couple weighs, 100 grammes; the electromotive force being $1\frac{1}{2}$ volts. It gives a current of 1 ampere for an hour. (*Comptes. Rend. XCVIII.* 224.)   P. C.

Observations on Faraday's Law, and on the Law Discovered by Mr. Bauty. A. WURTZ.

The law discovered by Mr. Bauty, concerning the conductability of very dilute saline solutions, is connected with Faraday's law, as M. Berthelot has observed, while adding that the interpretation of these laws is more complicated and obscure when expressed in atomic weights.

"Different chlorides submitted to the same electric current deposit at the negative pole quantities of metals corresponding to 1 atom of chlorine."

By electrolysis the chlorides : NaCl, Cu^2Cl^2, $CuCl^2$, $BiCl^3$, Sn Cl^4, Fe^2Cl^6 deposit quantities, equivalent to Na, $\frac{Cu^2}{2}, \frac{Cu}{2}, \frac{Bi}{3}, \frac{Sn}{4}, \frac{Te^2}{6}$ but these do not correspond to " equivalents " in the case of cuprous, besmuthic, stannic and ferric chlorides. In the electrolysis of HCl, H^2O, H^3N, for 1 volume or molecule of hydrogen, at the negative pole, there will be, at the positive pole, 1 volume of chlorine, $\frac{1}{2}$ volume of oxygen, $\frac{1}{3}$ volume of nitrogen. The quantities are strictly equivalent, but it cannot be said that $\frac{1}{3}$ volume of nitrogen represents 1 " equivalent " of nitrogen. The question here is not one of " equivalent " or of atomic weights, but one of valency or atomicity of elements. (*Comptes. Rend. XCVIII.* 176)
                                                              P. C.

Thermic Study of some Oxychlorides and Oxybromides of Mercury. G. ANDRE.

Heat of formation of HgO. HgCl, 3HgO. HgCl, 4HgO. HgCl, and the corresponding bromine compounds. (*Bul. Soc. Chim. XLI.* 274.)   E. W.

Equivalent of Chromium, determined by means of the Sulphate of Sesquioxyde. H. BAUBIGNY.

On p. 100, Baubigny gives processes for preparing pure sulphate of sesquioxide of chromium. By means of this salt, heated to 440° C, until the weight remains constant, the equivalent of chromium has been determined. The results are $Cr = 26.020$ and 26.012 if $S = 16$ and $Cr = 26.055$ and 26.116 if $S = 16.037$. Berzelius gave for Cr, 28.1, and later $Cr = 27.35$; Péligot in 1844 gave $Cr = 26.28$ and Berlin for the average of his results. Moberg from ammoniacal chrome alum, found in 1848, $Cr = 26.79$, a remarkable degree of accuracy considering the crudity of his methods. In 1861 Kessler found : $Cr = 26.15$, and Siewert, $Cr = 26.047$. (*Comptes Rend., XCVIII,* 146.)   P. C.

On the Krakatoa Ashes, in the Year 1883. DR. A. SAUER.

These ashes are composed of a grayish-white, fine, loose powder, in which coarser particles may be felt by rubbing between the fingers.

The composition was found to be as follows :

$Si\ O_2$	63.30 %
$Al_2\ O_3$	14.52 "
$Fe_2\ O_3$	5.58 "
$Ti\ O_2$	1.08 "
$Ca\ O$	4.00 "
$Mg\ O$	1.66 "
$Mn\ O$	0.23 "
$Na_2\ O$	5.14 "
$K_2\ O$	1.43 "
Loss on ignition	0.82
Total	97.76

Other analyses are given. (*Chem. Cent. Bl.* 1884, 129.)

                                         J. H. S., JR.

Russian Chemical Society. M. O. DAVIDOFF.

M. Brauner has determined the atomic weights of cerium, didymium and tellurium, obtaining results according better with Mendeleff's periodic system than the figures previously obtained.

M. Dieff communicates results of experiments on the action of argentic oxide with haloid salts of sodium. The amount of double decomposition depends upon the atomic weights of the elements taking part in the reaction.

M. Tchinkoff reports upon (1) the influence of certain mineral substances on the results of the elementary analysis of coal. (2) Finds that CO_2 at 200° afford no lead carbonate with PbO_2. (3) The increase in weight observed after heating a coal for some time to 165°, did not take place when the coal had been previously treated with ether. (4) The red color of some rock salts from the south of Russia was found to be due to the presence of manganese salts.

M. Beketoff communicates the results of thermochemical investigations on lithium.

M Betz finds that the sensitiveness of silver bromide to light, is greatly increased when it is crystallized from a weak solution of gelatine (or better of pure fish glue), and dried at 10 or 12°

M. Petrieff communicates the results of studies on the double decomposition of salts. Between carbonates and nitrates or acetates of several of the metals the amount of decomposition depends as a rule upon the atomic weights of the substances taken. In experimenting on the action of nitric acid in limited amount upon mixtures of bases, the amounts dissolved seemed to have no correspondence with the ratio of the atomic weights. The results with a nitrate were very different from those with the free acid.

M. Betekoff communicates a report on the relation of temperature of dissociation, heat of formation and atomic weights of atoms in combination. The nearer the atomic weights the higher the temperature of dissociation. This observation serves to explain some exceptions to the general rule that exothermic compounds are more stable than endothermic.

M. Potilitzine obtained results upon the rapidity of chemical re-

action, which go to show that there is a relation between the speed of the reaction, the atomic weight and the thermic effect.

M. Alexeef gives as his opinion upon the nature of solution, that solutions are formed under the influence of cohesion.

M. Brauner finds the atomic weight of tellurium to be 125, a result which gives it the proper position on Mendeleef's system. (*Bul. Soc. Chim.* XLI., 309 *et seq.*)   E. W.

On the Proportion of Imperfectly Oxydized Phosphorus Contained in Urine, especially in Nervous Diseases. Lépine, Eymonnet and Aubert.

In man, normal urine contains for every 100 parts of nitrogen (by sodium hypobromite), 20 parts of phosphoric acid as phosphates, and less than 0.25 of imperfectly oxidized phosphorous, estimated as phosphoric acid.

In a case of apoplexy, with loss of consciousness for two hours, for 100 parts of nitrogen, 21.6 of phosphoric acid were obtained as phosphates, and 1.07 from phosphorus imperfectly oxidized.

In a case of epilepsy, urine after the attack had for every 100 parts of nitrogen 31 of phosphoric acids as phosphates, and 0.71 as other phosphorus compounds.

In a case of *hystero*-epilepsy, for 100 parts of nitrogen—phosphoric acid of phosphates 27.5—from other phosphorous compounds, 0.5.

In a case of *delirium tremens*, for nitrogen 100 parts—phosphoric acid from phosphates, 34.5—from other phosphorous compounds, 0.47. (*Comptes. Rend. XCVLII.* 237.)   P. C.

Intensity of the Chemical Phenomena of Respiration in a Super-Oxygenated Atmosphere. L. de St. Martin.

Lavoisier and and Séguin have ascertained that no change takes place in the products of respiration whether the gas inspired be pure oxygen or super-oxygenated air. Regnault and Reiset, from their experiments, reached a similar conclusion.

The following results are obtained by the author:

Animal used for experiment.	Properties of oxygen in air per cent.	CO_2 given out per hour.
Guinea Pig,	20 95	511 C. C.
"	"	501 "
"	"	558 "
"	"	475 "
"	"	530 "
"	66	529 "
"	58	500 "
"	50	504 "
Rat,	55	506 "
"	20.95	525 "
"	75	535 "
"	20.95	551 "

Conclusion—Super-oxygenation has no appreciable influence on the products of respiration. (Comptes. Rend. XCVIII. 241.)

P. C.

Heating of Cultivations of Bacillus anthracis obtained on a Large Scale. A. CHAUVEAU.

After obtaining a cultivation in a large flask, as described on p. 73, small portions are taken and heated at temperatures from 80° to 90° C. Inoculation shows what degree of heating is sufficient to obtain a desired result with the cultivation under examination. Generally 84° C gives the best result for the first inoculation, and 82° C for the second. The author, however, has had liquids which required heating to 80° for the first inoculation and 78° for the second. When the virulence is great, it keeps pretty constant after a cultivation has been kept up several months without heating. Weak virulence is apt to diminish by prolonged cultivation.

On vaccinating with liquids very slightly attenuated, quite a number of animals have died; with greater attenuations the deaths have been very few. After using liquids with a minimum of virulence, the deaths from inoculation with strong virus have been very few. Double inoculation gives almost perfect immunity, even when both inoculations have been practiced with very weak virus. (*Comptes Rend., XCVIII.*, 126.)   P. C.

ORGANIC CHEMISTRY.

On Tetranitrated Ethylene Bromide.   A. VILLIERS.

The potassium compound, C_4 Br_2 $(NO)_4$ $2KO$, (old style), previously described by the author (Bul. Soc. Chem., 37, 451), on being treated with an acid affords a coloress or slightly yellow oil, which is, no doubt, the compound sought, but it is so unstable that attempts to isolate it for examination have, so far, been unsuccessful. (*Bul. Soc. Chim. XLI.*, 281.)   E. W.

On Nitrated Derivatives of Ethelene hydride. A. VILLIERS.

The potassium compound referred to in the last paper is decomposed by sulphurous acid, sodium amalgam, or zinc in alkaline solution, with formation of hydrocyanic acid, hydrobromic acid and ammonia. HS also destroys it, though if the addition is stopped before the decomposition has proceeded too far, $C_4K_2(NO_4)_4$ is formed. This substance detonates violently at 200°, or even at 100°, when lightly touched. With acids, even when extremely dilute, it decomposes explosively. Among the products of decomposition by H_2S, is a base containing potassium and sulphur, and forming a fine chloroplatinate. With potassium sulphate and carbonate, the tetra-nitrated potassium bromine compound yields a body with the composition $2C_4K_2(NO_4)_4$ $3KO$, SO_3. By treating with barium chloride in hot concentrated solution the same compound as before, $C_4K_2(NO_4)_4$ is obtained.

This compound is peculiar in having the bromine replaced by potassium. By treating it with bromines the original compound may be re-formed (formulæ, old style). (*Bul. Soc. Chim. XLI.*, 282.)   E. W.

On a Case of Isomerism of Chloronitrated Camphor.   P. CAZENEUVE.

Reference is made to a previous paper describing the formation of one chloronitrated camphor. (Bul. Soc. Chem., 1883, 503). The alcoholic solution from which the first was crystallized, on being cooled down, yields the second chloronitrated camphor. The chararacters of the two are contrasted:

| FIRST (normal). | SECOND (isomeride). |
| Hard, pulverizes easily; not | Soft, pulverized with difficulty. |

readily soluble in cold alcohol, crystallizes from ether in prisms.

Insoluble in water, very soluble in cold alcohol and ether. Ether on evaporating leaves an ill-defined crystalloid mass.

Lævorotatory $[\alpha]$ J$=$ —6°2.
Fuses at 95°.

Dextrorotatory $[\alpha]$ J$=+$17°.
Fuses at 83°.

Priority in these researches is claimed over MM. R. Schiff and J. Puliti. (*Bul. Soc. Chim. XLI.*, 285.)   E. W.

On Bromised Xylenol. P. ADAM.

By treating paraxylenol at 160° with bromine, introducing the latter rather rapidly, the compound $C_6H_3(OH)(CH_2Br)_2$ was obtained. (*Bul. Soc. Chim. XLI.*, 288.)   E. W.

Note on Furfurol. A. GUYARD.

Furfurol is always formed by projecting a substance consisting essentially of a carbohydrate into a hot mixture of equal parts of sulphuric acid and water. By covering the vessel in which the reaction takes place with a paper soaked with aniline acetate, the paper takes a fine rose tint, which however spontaneously decomposes in a short time. Swedish filter paper affords very little furfurol; bran affords much. Cellulose, and some other substance the nature of which is not determined, seem to be necessary for the production of the furfurol. Pyroligneous acid contains relatively large amounts of furfurol. This gives the bad taste to vinegars. By agitation with benzine, furfurol may be removed. The benzine may then be distilled off, leaving the furfurol. (*Bul. Soc Chim. XLI.*, 290.)   E. W.

Synthesis of Tartaric Glucoside. A. GUYARD.

By projecting the pulverized, anhydrous tartaric acid of M. Fremy into melted glucose, until the mass becomes·pasty and almost infusible, aqueous vapor is disengaged, and a substance is obtained nearly white, very soluble in water, unaltered by boiling in it, in which neither tartaric acid nor glucose can be detected by the usual reagents. Boiling water with a mineral acid for a few minutes affords tartaric acid and glucose. (*Bul. Soc. Chim. XLI.*, 291.)   E. W.

On a New Coloring Matter derived from Chlorophyll.
ROBERT SACHSSE.

In a previous article the author described three coloring matters, which he had isolated from chlorophyll. They differ from one another not only in composition but, also owing to the fact that one is sparingly soluble, while the other is nearly insoluble in alcohol. The third is easily soluble in alcohol. These compounds are named by the author as follows: That which is nearly insoluble in alcohol he calls α-phaeochlorophyll; that which is sparingly soluble, β-phaeochlorophyll, and that easily soluble in alcohol, γ-phaeochlorophyll.

β-phaeochlorophyll, when dry, appears nearly black. It is insoluble in water, but soluble in hot alcohol, from which it separates on cooling, in the shape of an amorphous precipitate. The formula of this compound is $C_{27} H_{33} N_3 O_4$; (*Chem. Cent. Bl.* 1884, 113).
J. H. S., JR.

On the Action of Chlorine on Sulphuric Compounds and on Amylic Oxysulphides. W. SPRING and C. WINSSINGER.

The introduction of the sulphonic group into a hydrocarbon seems to act as a bar to the formation of any substitution product of chlorine in the molecules. As regards the higher homologues of ethylsulphuric acid, Kékulé believes that they are capable of forming chlorine substitution products, the chlorine entering into the molecule at a part as far as possible removed from the influence of the sulphonic group. Kolbe, however, dissented from this view The results of the authors tend to confirm the view of Kékulé. The group causing this resistance to chlorination is found to be SO_2 itself, not S or SO. (*Bul. Soc. Chim. XLI.*, 301.)   E. W.

On the Products Resulting from the Reduction of Erythrite by Formic Acid. A. HENNINGER.

The author and M. Tollens have communicated to the Academy a process for the preparation of allylic alcohol, founded on the reduction of glycerine by oxalic acid. As an intermediate product, a formine of glycerine is obtained, which is decomposed by heat into allylic alcohol, carbonic acid and water.

The same reaction has been extended to other multivalent al-

cohols, glycols erythite and mannite. The experiments which the author described in 1873, led him to the conclusion that formic acid effects reductions of valency of two steps at a time, and gives rise to unsaturated bodies. Formic acid is the only body which acts in this manner. When erythrite is boiled for six hours with $2\frac{1}{2}$ times its weight of formic acid a crystallizable residue is left on driving out the excess of acid by heating to 190° or 200° C. This residue has the composition of diformine $C^4 H_2^6 (O H)^2 (CHO^2)^2$, but is in reality a mixture of several formines, which may be separated by crystallization from anhydrous ether or absolute alcohol. One of these is tetraformine.

The mixture of formines is decomposed by heating at 210°—220° C. The reactions are:

$C^4 H^6 (OH)^2 (OCHO)^2$.

$1 = CO^2 + H^2O + C^4 H^6 (OH) (OCHO)$.

$2° = 2CO^2 + 2H^2O + C^4 H^6$.

$3° = CO^2 + CO + 2H^2O + C^4 H^6 O$.

$4° C^4 H^{10} O^4 = H^2 O + C^4 H^8 O^3$.
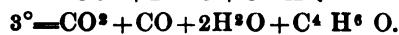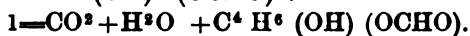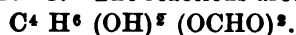
$C^4 H^8 O^3$ is *erythrane*, an anhydride of erythrite, not previously described. (*Comptes Rend., XCVIII*, 149.) P. C.

On an Aromatic Di-acetone. E. Louïse.

The constitution of mesitylene, considered as symmetrical trimethylbenzine, leads to the supposition that the successive replacement of the aromatic hydrogens by the radical benzoyl, will give rise to three acetonic compounds. In a previous communication the author has described the mono-substitution product, *benzoyl-mesitylene*. The present communication relates to *di-benzoyl-mesitylene*, formed by the action of benzoyl chloride on benzoil mesitylene. Thirty grammes of benzoyl mesitylene are dissolved in 80 grammes of benzoyl chloride and heated to 150° C. Aluminic chloride is added and H Cl escapes. The residue is a thick, black mud of benzoyl, which contains the body sought. The excess of chloride is dissolved in water and the residue dissolved in alcohol mixed with ether. Further purified by distillation and crystallization the resulting body has the composition: $C_{23} H_{20} O_2$ $= (C^6 H^5 CO)^2 C^6 H (C H^3)^3$, which is di-benzoyl mesitylene. This body is colorless, transparent, soluble in ether, alcohol, petroleum, etc. By crystallization from a mixture of acetone and chloroform, large crystals, often several centimetres long, are obtained.

On a Nitrogenized Colloid derived from Amidobenzoic Acid. E. GRIMAUX.

By the action of phosphorus perchloride on amidobenzoic acid, a white powder is obtained, which appears to be an anhydride, originating in the union of several molecules of acid. This white powder is soluble in ammonia. The solution filters very slowly, and when concentrated *in vacuo*, at ordinary temperatures, it forms a thick jelly, and dries to translucent, yellowish scales, which are tasteless and inodorous, and resemble blood albumen. It swells in cold water, and dissolves slowly. It is easily soluble in hot water, and may be heated to 100° C without becoming insoluble. Evaporated at 100° C, it losses its solubility. This character also belongs to albumen.

Experiments made with a 2% solution of the colloid show that it behaves like animal colloids obtained from living organisms. It is precipitated by hydrochloric, nitric, acetic, tartaric and oxalic acids.

In presence of sodium chloride, sodium sulphate and potassium nitrate, carbonic acid coagulates its solutions at ordinary temperatures. Alum, corrosive sublimate, mercuric nitrate and tannin give voluminous precipitates. Rennet coagulates its solutions like those of caseine. (*Comptes. Rend. XCVIII.* 231.) P. C.

Russian Chemical Society. Correspondence of M. O. DAVI-DOFF.

M. Ponomareff finds confirmation of his belief that allantoxanic acid is parabanic acid in which an atom of O is replaced by the residue of carbonic acid.

M. Reoformatsky has obtained C_8H_{14} by treating allyldiethyl-carbinol with dilute H_2SO_4.

M. P. Alexeef proposes the constitutional formula of indigo
blue $\quad$ N—C_6H_4—C(OH) $\diagdown$ $\quad$ as explaining
$\qquad\qquad$ | $\qquad\qquad\qquad\qquad$ C
$\qquad\qquad$ N—C_6H_4—C(OH) $\diagup$
more completely the phenomena manifested by that body.

M. Petrieff has studied first, the isomerism of fumaric and maleic acid; second, the action of zinc ethyl on the neutral ether of fumaric acid.

The same author also communicates information regarding a new

group of coloring matters from aniline, the starting point being the substance obtained by the action of potassium nitrite on aniline chlorhydrate.

To purify bone oils, M. Petrieff washes with a solution of potassium permanganate in dilute H_2SO_4, then with water, and finally filters through bone black.

M. Lupatkine has obtained a chlorinated alcohol by the action of zinc and allyl iodide on epichlorhydrin.

M. Chestakoff has obtained a compound, apparently diallyl carbinol, in which one atom of hydrogen has been replaced by a propyl.

M. Melikoff communicates the results of his researches on the homologues of glycidic acid.

M. Ponomareff gives the result of studies of cyanuric acid ethers and the constitution of this acid. (*Bul. Soc. Chim.* XLI, 309 *et seq.*)   E. W.

ANALYTICAL CHEMISTRY.

On the Oxidation and Determination of Chromium of Sesquioxide. H. BAUBIGNY.

I. The tendency of Cr_2O_3 to combine with oxides of other metals and thus to be precipitated, or fail to be precipitated under ordinary conditions, has led to an attempt to convert the chromium into the form of acid when it or the metallic oxides with which it may be mixed are to be determined.

II. Preference is given to the method of Storer (Proc. Am. Acad. 6, 338), in which the pulverized material is dejected at a temperature not above 100° in nitric acid into which potassium chlorate is thrown from time to time. The chromium in chrome iron may be entirely extracted by this treatment. The process has recently been published in the Berichte (16, p. 3,008), as a new and original method.

III. After converting the chromium into the form of acid, alumina or ferric oxide may be separated by addition of sodium bicarbonate in quantity just sufficient to give an alkaline reaction with litmus.

In the filtrate the chromium may be separated by acidifying with sulphuric acid, adding ammonia, and saturating with H_2S.

IV. The presence of even minute traces of alkali in the precipitate of chromic hydrate or oxide, causes the formation of alkaline chromate which may prove a source of error.

V. If the chromium is determined as $BaCrO_4$, the solution should be faintly acid. Sulphate must be absent. If it is determined by Rose's method, using $Hg_2 (NO_3)_2$, HCl, H_2SO_4 and ammonia salts must be absent. (*Bul. Soc. Chim. XLI.*, 291.)   E. W.

Dissemination, Accumulation and Determination of Phosphoric Acid in Arable Soils. P. DE GASPARIN.

All granitic, metamorphic, volcanic, schistous and calcareous rocks contain phosphoric acid.

. The most active agents of the decomposition of rocks are mosses and lichens. On a rock containing $\frac{2}{1000}$ of phosphoric acid, a kilogramme of dry mosses and lichens contain 1.20 gr. of phosphoric acid or six times as much as the rock.

On a field of calcareous clay at Tarascon, the soil of which contains $2\frac{1}{2}$ p. c. of organic matter, this organic matter had $\frac{1}{1000}$ of phosphoric acid or 125 kilogrammes per hectare. This was but a small quantity compared to the total phosphoric acid, which was 2,500 kilogrammes per hectare. It may be said that about 5 per cent. of the phosphoric acid is combined with organic matters. It is mainly these 5 per cent. which furnish phosphoric acid to plants. This small accumulation may be increased by adding manure. To determine phosphoric acid, the author recommends that the sample of earth should be treated by aqua regia having an excess of hydrochloric acid. In the filtered liquid ammonia is added slowly and not in sufficient quantity to make the liquid alkaline. Afterwards an excess of ammonia is added, and *all* the phosphoric acid is left in the precipitate. This is calcined, ground to a fine powder and treated with nitric acid of $\frac{1}{10}$ strength. The filtered solution is precipitated by ammonium molybdate, etc. (*Comptes. Rend. XCVIII.* 201.)   P. C.

Determination of Water in Starch. L. BLONDONNEAU.

If there is no acid present, 5 or 10 grammes of starch are heated in a porcelain dish at a very low heat so that 60° C. is only reached

in 3 hours. Then the stove is heated to 100°. It may even be
heated to 110°. If the starch is acid there should be added to it
its own weight of water and a few drops of ammonia. Then it
should be dried slowly, the temperature not exceeding 40°.
When nearly dry the operation proceeds as above. Desiccation
of water in starch can only be complete at 115° or a vacuum
must be used. A thoroughly dried starch becomes heated when
moistened with water. (*Comptes Rend. XCVIII.* 153). P. C.

On the Evaluation of Wines, from Analytical Data.
Dr. J. Nessler.

According to Kayser, wines containing 12 vol. per cent. of alco-
hol, should contain at least 1.2 % glycerine. The author claims on
the contrary, that the relation of glycerine to alcohol, in the best
quality of wines, is as 7—100.

Kayser further states that, in a certain wine examined by both
parties, the relation of extract and mineral matter to the alcohol
present was too low.

The author and Dr. Barth had, however, previously shown that,
in some cases, no exact limit can be assigned for these relations.
He further states that the total ash of wines may be relied upon,
but does not agree with Kayser, who claims that the value of a
wine may be determined by estimating separately each of the
mineral constituents of the ash. Thus it would not be right to con-
demn a wine because it only contained 0.009 % lime, or .011 % mag-
nesia. (*Chem. Cent. Bl.* 1884, 133).

J. H. S., Jr.

INDUSTRIAL CHEMISTRY.

On the Manufacture of Cuprammonium and Zinc ammonium Compounds and their Technical Adaptation. C. R. A. WRIGHT.

Reference is made to the well-known property of copper and zinc salts to form ammonia compounds. The solutions, however, lose ammonia by heating, or if concentrated, by standing for some time. The more dilute they are the longer they take to decompose.

The Patent Waterproof Paper and Canvas Co., of Willesden Junction, have put on the market materials known as the Willesden fabrics, consisting of paper for lining damp walls, a thicker quality for roofing, and also canvas, ropes, etc., prepared with ammoniacal copper solution so as to be mould-proof.

The process consists in preparing a concentrated solution of cuprammonium hydroxide, and passing the goods through a bath of this material at just such a rate as will permit of the pectising and gelatinizing of the exterior of the paper or canvas, without wholly disintegrating the mass, so that the material retains sufficient coherence to enable it to be passed over and under the usual drums, etc., of a paper mill, and so to be dried in the ordinary way. To obtain a " two-ply " card, two reels of paper are simultaneously employed, passed simultaneously through the bath, and then pressed together and dried as a whole.

The best qualities of thicker papers, 4, 8-ply, etc., are made by pressing two or more rolls of two-ply through the bath a second time, pressing them together and drying.

The compound is wholly unaffected by water when once dry. In some cases a mixture of zinc ammonium and cuprammonium hydroxides is used. The zinc compound alone does not give good results with paper.

The solutions contain 100 to 150 pounds ammonia, and 20 to 25 pounds (metallic) copper per 100 gallons.

The hydroxide appears to have a higher pectising power than any of the salts, sulphate, for instance, and also leaves no soluble compounds in the finished product.

The liquid is made by the combined action of air and ammonia water on metallic copper. Only about one-sixth of the oxygen of

the air used was found to be absorbed. The passage of the air through the mixture of copper and ammonia solution carries away much of the ammonia, so that provision has to be made for recovering this, as also the ammonia given off in drying the goods. (*J. Soc. Ch. Ind.* III., 2, 211). E. W.

On the Filtration of Potable Water. S. H. JOHNSON.

Five well-known cases of outbreaks of disease from the use of infected drinking water are quoted.

Filtration through sand does not have any oxidizing effect on the impurities. The upper surface of each grain of sand simply serves as a catchment shelf on which the sediment is deposited. Animal charcoal, as a filtering material for domestic purposes, has the objection that the phosphates present afford nutriment to the various germs, and the filter soon becomes foul.

The author proposes the use of filter presses, in which the filtering material is a paper containing 10 to 20 per cent. of animal charcoal, which has been freed from phosphates by treatment with acid and in which the power is supplied by the pressure in the service pipes. (*J. Soc. Ch. Ind.* III., 2, 126). E. W.

Notes on Kieselguhr and its Technical Applications. A. HAACKE.

The best qualities of kieselguhr are obtained near Naterleuss, between Hamburg and Hanover. The deposit is there about 150 feet below the surface, being overlaid by thin beds of diluvial and alluvial origin. The upper stratum is white, and contains but little organic matter or sand, and only requires washing to fit it for the market. The second stratum is gray, and contains but little sand. When calcined to remove the organic matter, it affords the finest product. The lowest and thickest stratum (of 50 to 100 feet in depth) supplies the green kieselguhr, which contains up to 30 per cent. of organic matter. When dried this will glow like peat when once set on fire. As it contains enough fuel to burn itself, it is prepared by burning in kilns about 15 feet high by 6 feet diameter, the raw (dried) material being charged at the top, and the finished product raked out at the bottom.

The use of kieselguhr for the manufacture of alkaline silicates has been superseded by white sand, on account both of the value

of the kieselguhr for other purposes, and the large size of the melt-
ing pots which were required, as the material is quite bulky. In Ger-
many an 82 per cent. dynamite has been made with this kieselguhr,
and it is also much used as a non-conductor for safes, stoves, steam
pipe, jacketings, etc.

Experiments are being made looking toward its use in the manu-
ufacture of light refractory fire bricks.

Sticks of kieselguhr saturated with bromine are used for the
purpose of disinfection.

A patent has been taken out in Germany for the use of kiesel-
guhr as an absorbent of sulphuric acid (66°) to facilitate transporta-
tion without danger of leakage and loss. Other application are
mentioned. (*J. Soc. Ch. Ind.* III., 2, 132). E. W.

The loss of Nitre in the Manufacture of Vitriol. G.
ESCHELLMANN.

Results of tests made at the Widnes Works (J. Muspratt &
Sons). The nitre used was 2.75 to 3.24 per cent. of the sulphur.
Of the nitre used, 10.7 per cent. to 12.5 per cent. of this was left
unabsorbed. The mechanical losses represent 22 per cent., distrib-
uted as follows :

1. At Glover tower, 1%

2. Gay Lussac tower, $\left\{ \begin{array}{l} \textit{(a.} \text{ Non-absorption of soluble gas, 12.} \\ \textit{(b.} \text{ Escape of nitric oxide,} \qquad\quad 7. \end{array} \right\}$ 19%

3. Leakage, etc., 2%

As to chemical losses by reduction of nitrogen oxides, calcula-
tion showed that an increase of steam by one-third would only
raise the temperature of the first chamber by 2°.6. The variation
in temperature due to that of the external air amounted to less
than 5° in 24 hours.

The variation due to potting was found to be from 48 to 68° C.,
showing lowest when the nitre pot was nearly exhausted.

A fall in temperature indicates less vitriol made.

Loss by reduction results from fall of temperature or excess of
water. In an experiment where vitriol with four equivalents of
water was made instead of three, the loss by reduction amounted
to 10.5 per cent. of the nitre. Excess of oxygen caused a loss of
sulphur, and a fall of temperature in the chambers with less than
3 per cent. of oxygen much extra nitre is required.

To the above table the author adds 31½ per cent. of loss from

steam at the inlets, leaving still over 46% unaccounted for. (*J. Soc. Ch. Ind.* III., 2, 134). E. W.

On the Action of Nitrates on Alkaline Sulphides. E. W. PARNELL.

The author has endeavored to find the cause of the difference between the conclusions to which his experiments led, and those obtained by Messrs. Lunge and Smith. Those gentlemen concluded from their experiments with crude Leblanc liquors that metallic iron boiled in an alkaline solution with nitrate afforded ammonia. The author, working with a solution of nitrate in caustic soda, was unable to verify this conclusion, but in a set of experiments which are here described at length, found that such reduction took place in presence of iron oxide or sulphide at 370° Fahr. and upwards. His conclusion is that in making experiments with the Leblanc liquors on metallic iron, Messrs. Lunge and Smith really produced an iron sulphide which reduced the nitrate. (*J. Soc. Ch. Ind.* III., 2, 138). E. W.

On the Dyeing Properties of Authragallol. R. BOURCART.

The compound has been known for several years, but has not been recognized hitherto as a coloring matter. It is prepared either by effecting a combination of benzoic and gallic acids in presence of sulphuric or by the combination of phthalic acid and pyrogallol. After long treatment with sulphuric acid and thorough cooling, the dyestuff is precipitated by running the sulphuric acid solution into water (which precipitates it), and washing it free from acid. It is an isomer of purpurin. Specimens of the colors produced by it were exhibited, and a sample accompanies the article. A light brown was produced with an alumina mordant, drabs with iron mordant, and dark brown with combinations of alumina and iron mordants. (*J. Soc. Ch. Ind.* III., 2, 140). E. W.

Notes on some of the Modes of Preparing, Bleaching, Dyeing and Finishing Cotton Goods, Practiced by Lancashire and Yorkshire Dyers, and their Results.. J. SHARP.

The machinery and methods used in Lancashire and Yorkshire are contrasted. Incidentally the author remarks that the use of

mordants for dyeing "black cotton Italians" is objectionable, since in a short time the black becomes a green olive, and a predisposition to mildew is induced.

In dyeing goods of mixed cotton and woolen, the latter must be dyed before the cotton is either bleached or dyed.

In the dyeing of "shot" or two-colored effects, sodium stannate or tin chloride cannot be used as mordants.

As regards fixing coal-tar colors on cotton, the author divides the colors into basic colors and acid colors. The first have, as a rule, a much greater affinity for cotton, though it is usually preferable to use mordants with them. The acid colors do not dye cotton well, even with a mordant, but simply serve as impregnation colors. (*J. Soc. Ch. Ind.* III., 2, 141). E. W.

Abstracts of American Patents relating to Chemistry.

February 26, 1884.

294,003.—Hot-blast apparatus for blast furnaces.—J. F. Bennett.

294,051.—Process of making copper salts by the aid of electricity.—J. K. Kessler.

Claim.—1. The process of making basic acetate of copper, which consists, first, in passing an electric current through a solution of potassium chloride or sodium chloride, using copper as an anode and any suitable substance as a cathode, keeping the products formed at the opposite poles separate from each other, and then mixing them together, whereby hydrated suboxide of copper is precipitated, and secondly, in mixing the precipitated suboxide of copper, properly washed and dried, with neutral acetate of copper, moistening the mixture with water, and exposing it to the air.

294,052.—Lactometer.—A. R. Leeds.

Consists of a cylindrical glass vessel in combination with a glass stopper, made of any non-transparent material, on which are drawn lines at regular intervals and parallel to the circumference of its base, forming a graduated scale.

294,080.—Manufacture of cement.—L. Roth.

Burns and pulverizes a mixture of blast furnace cinder, carbonate of lime, and an alkaline chloride.

294,159.—Process of extracting sugar from molasses, syrups and the juices of plants.—C. Steffen.

Consists (1.) in mixing, with an aqueous saccharine solution, enough lime at one operation to form, first, a lime-saturated saccharine solution; and, second, a precipitate of calcareous saccharate, the temperature of the mixture being maintained below 95° Fahr., and as nearly uniform as possible.

(2.) In the process of reducing the percentage of lime in the finished and purified saccharate, before its conversion into sugar, which consists in mixing the hard, purified saccharate with a saccharine liquid, and then separating the precipitated hydrate of lime by filtering.

294,285.—Process of an apparatus for the production of highly purified alcohol.—J. A. Stelzner.

Consists in injecting the crude alcohol into the still in the form of spray, vaporizing and purifying the same by means of injected steam into the sprayed alcohol, and injecting water in the form of spray of gradually diminishing temperature into the combined steam and alcohol vapors as they rise on their way to the rectifying column. The sprayed alcohol is also subjected to the action of an alkali or an oil, for the purpose of removing impurities contained in the crude alcohol.

294,301.—Apparatus for producing and burning gas.—L. D. York.

Brief. Gas is produced for heating and other purposes by passing air through gas-producing coal, so as to produce perfect combustion in the lower part thereof, forming carbonic acid, then converting such gas into carbonic oxide, and, at the same time, distilling off the heavy hydro-carbons by passing the carbonic acid up through the mass of coal, then introducing superheated steam into the gaseous products, and finally passing them down through a bed of incandescent carbon, whereby the added steam is decomposed, forming an additional volume of carbonic oxide and hydrogen, and the gases are fixed.

294,314.—Regenerative hot-blast stove for blast furnaces.—B. Ford and J. Moncur.

March 4, 1884.

Reissue 10,457, Original No. 252,783.—Centrifugal filtering or straining apparatus.—S. M. Lillie.

294,425.—Manufacture of linseed oil.—A. J. Adams.

Extracts the linseed oil from flaxseed by moistening the seed in neutral oil, grinding the moistened seed, and pressing and filtering the oil from the ground seed.

294,530 and 294,531.—Art of manufacturing starch.—W. W. Underhill.

Consists in first bringing the starch water or starch liquor, which has been

separated from the bran or coarser portions of the soaked and ground grain, to a density of 3° or 6°, then adding sufficient sulphurous acid to obtain an acid reaction, and afterwards recovering the starch by subsidence from the starch water.

The second patent relates to a similar treatment of the "tailings."

294,534.—Apparatus for manufacturing gas.—B. Van Steenbergh.
Brief. Gas is made by the decomposition of steam. and oil in contact with carbonaceous material in heated retorts.

294,592.—Manufacture of cream of tartar.—F. Dietrich.
Consists in treating the dissolved argols with phosphoric acid or its compounds, boiling the mixture, clarifying it with clay, and finally decolorizing it with animal charcoal which has been previously treated with muriatic acid.

294,602.—Hydrocarbon gas Generator.—J. Flannery.

294,619.—Bleaching of paper pulp or other fibrous or textile materials, or fabrics.—E. Hermite.
Decomposes chlorides of sodium or potassium by an electric current, under such conditions as to cause the formation of an alkali (soda or potash) and a metallic chloride, preferably lead chloride. Then decomposes the metallic chloride in the ¨presence of the materials that are to be bleached, and re¯ covers the metal in the metallic state for use in the subsequent operations.

294,646.—Apparatus for generating and purifying gaseous fuel.—S. Lloyd.

294,661.—Plastic compound from pyroxyline and mica.—G. M. Mowbray.
Consists of mica, soluble pyroxyline, ¸coloring matters, and¨ inert substances to serve as a body thereto.

294,727.—Composition for cleaning and renovating fabrics.—T. Ewing.
Cleans and restores the colors of fabrics by applying to them a composition of aniline solution, alkali and ammonia, and then sponging the fabric.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Regular Meeting, Friday May 2d, 1884.

Vice-President Leeds in the Chair.

The minutes of the April meeting were read and approved.

The Librarian read a list of additions to the library, and letters with regard to exchanges.

The following gentlemen were proposed for membership :

Richard Linke, 345 East 18th street, New York City, proposed by James H. Stebbins Jr., Wm. Rupp, Albert R. Leeds.

Arthur L. Greene, Ann Arbor, Mich., proposed by A. R. Prescott, P. Casamajor, H. Endemann.

Dr. H. M. Baker, 87 Ross street, Brooklyn, N. Y., proposed by P. Casamajor, H. Endemann, M. Alsberg.

As an associate member, Charles A. Heinitsh, Lancaster, Pa., proposed by A. A. Breneman, A. R. Leeds, W. Rupp.

The following papers were then read :

1st. On the Spectra of Azo-Colors, (2d paper) by J. H. Stebbins, Jr.

Discussion by Messrs. Doremus, Breneman, Stebbins, Endemann and the Chair.

2d. On the action of Diazo-β-naphthaline chloride on Phenols, by J. H. Stebbins, Jr.

Discussion by Messrs. Waldstein, Casamajor and Endemann.

3d. On β Phenanthrolmonosulpho-acid, by Wm. Rupp.

Discussion by Messrs. Stebbins and Rupp.

The meeting then adjourned.

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C. E. MUNSELL,
Recording Secretary.

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ADDITIONS TO THE LIBRARY OF THE AMERICAN CHEMICAL SOCIETY.

DURING APRIL, 1884.

Presented by Prof. A. R. Leeds :

 A. Naquet. "Principes de Chimie Fondeé sur les Theories Modernes."

 A. Herlant. "Precis du Course de Chimie Usuelle."

 S. Clegg, Jr. "A Practical Treatise on the Manufacture and Distribution of Coal Gas."

Presented by the American Institute of Mining Engineers :

 A. Springer. "The Torsion Balance" (pamphlet).

 M. Troilius. "Tables for Facilitating the Heat Calculations of Furnace Gases Containing CO_2, CO, CH_4, H and N" (pamphlet).

 M. Troilius. "Sulphur Determination in Steel" (pamphlet).

 P. G. Salom. "Physical and Chemical Tests of Steel for Boiler- and Steel-Plate for the United States Government Cruisers" (pamphlet).

 J. T. Kimball. "The Quemahoning Coal Field of Somerset County, Pa." (pamphlet).

 F. Firmstone. "Tamping Drill Holes with Plaster of Paris" (pamphlet).

 F. Firmstone. "Note Concerning Certain Incrustations on Pig Iron" (pamphlet).

 N. W. Lord. "Note on the Presence of Lithia in Ohio Fire Clays" (pamphlet).

 N. W. Lord. "Note on Some Highly Phosphuretted Pig Irons" (pamphlet).

 E. Gridley. "Notes Concerning a Grade of Iron Made from Carbonate Ore" (pamphlet).

 F. Julian. "Note on the Determination of Phosphorus in Iron" (pamphlet).

 W. B. Devereux. "Notes on Iron Ore Deposits in Pitkin County, Colorado" (pamphlet).

From the Bureau of Education, Washington, D. C.:

 "Circular of Information, No. 1, 1884. Meeting of the International Prison Congress at Rome, in October, 1883."

"Circular of Information, No. 5, 1873. Account of College Commencements During 1873 in the Western and Southern States."

"Report of the Director of the American School of Classical Studies at Athens for the Year 1882–83."

From the Massachusetts State Agricultural Experiment Station :
Bulletin No. 8, April, 1884.
"Fodder and Fodder Analyses" (pamphlet).

ON THE SPECTRA OF AZO-COLORS.

(Second Paper.)

By J. H. STEBBINS, JR.

In the last paper on this subject I described a series of dyestuffs, which differ from one another not only chemically but also, to quite an extent spectroscopically, if I may use the term.

It will also be remembered that they produced no characteristic absorption bands, but merely a cutting out of the green, blue and violet parts of the solar spectrum. This cutting out of the spectrum was more or less pronounced according to the nature and strength of the solutions.

The few remaining dyestuffs of this series, which I have now to describe, possess these properties likewise but to a much less extent than the former ones.

I have also made quantitative tests with the view of determining how small an amount of coloring matter can be estimated by this means.

Ponceau R. R.

Pseudocumol-azo-β-naphtholdisulpho-acid
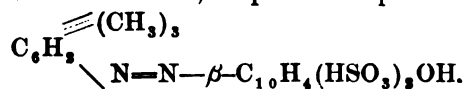
$$C_6H_3 \underset{\diagdown N=N-\beta-C_{10}H_4(HSO_3)_2OH.}{\overset{\diagup(CH_3)_3}{}}$$

Dissolved ¼ grm. in 1 litre of water and examined the spectrum. It gave a band extending from C. 48—H. 170.

Region of greatest absorption is D. 52—H. 170.

The same on being treated with caustic soda produced a spectrum extending from C. 42—H. 170. Region of maximum absorption D. 51—H. 170. This dyestuff, as will be seen, (Plate II) cuts out all the green, blue and violet parts of the solar spectrum. The absorption band is still plainly visible with a dilution of 1 pt. in 40,000.

Anisole Red.

Anisol-azo-β-naphtholmonosulpho-acid

$$C_6H_4 \underset{\diagdown N=N-\beta-C_{10}H_5(HSO_3)OH.}{\overset{\diagup OCH_3}{}}$$
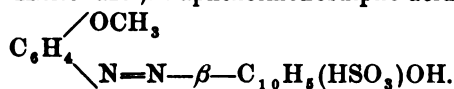
Dissolved ¼ grm. in 1 litre of water and observed the spectrum. The absorption band extends from C. 47 —H. 170.

Plate II
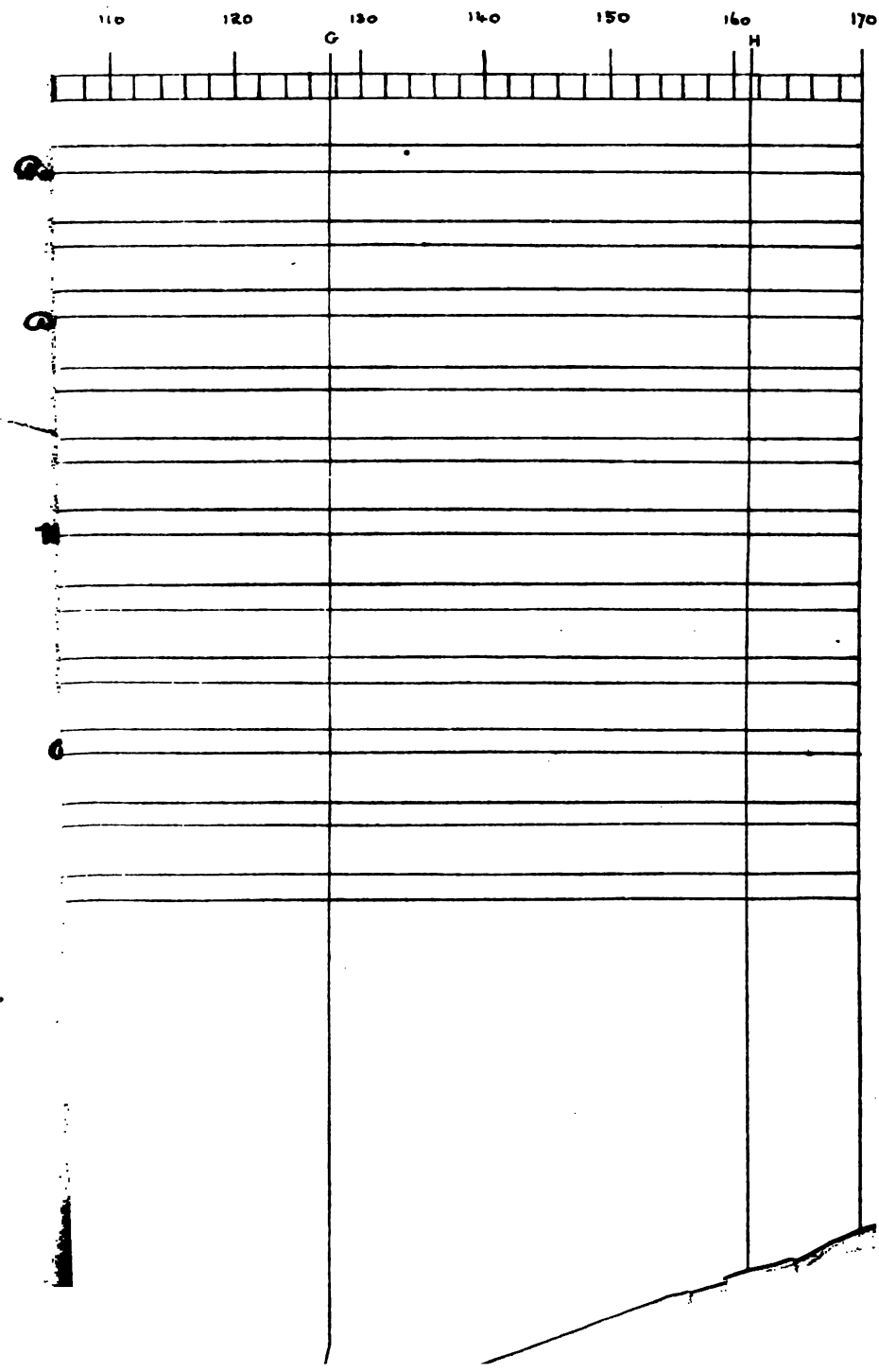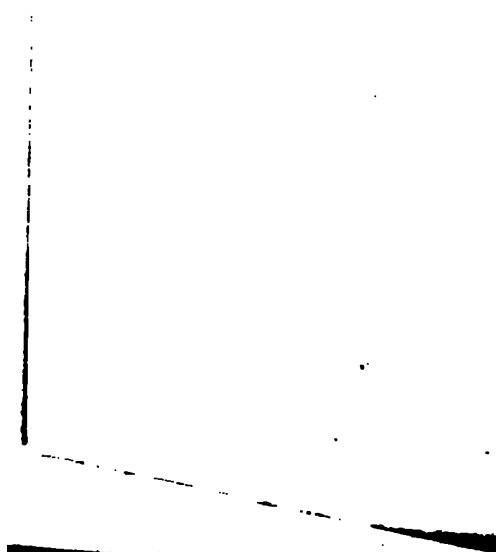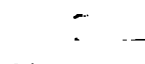
Region of maximum absorption D. 52—H. 170.

The same on being treated with caustic soda produces but a very slight variation in the position of the absorption band. It extends from C. 48—H. 170. Region of greatest absorption D. 54—H. 170.

The same diluted to 1 pt. in 40,000, still shows the band very plainly, only in this case it cuts out less of the green.

Its position extends from D. 54—H. 170.

Region of greatest absortion D. 64—170.

A dilution of 1 pt. in 400,000 no longer produces an absorption, but still plainly shows a faint coloration.

Bordeaux.

Naphthalene-azo-β-naphtholdisulpho-acid

$$C_{10}H_7—N=N—\beta-C_{10}H_4(SO_3H)_2OH.$$
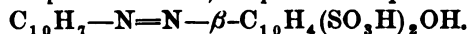
Dissolved $\frac{1}{4}$ grm. in 1 litre of water and examined the absorption band. In this case the band extends from C. 40—H. 170. Region of greatest absorption C. 42—H. 170. The same diluted to 1 pt. in 40,000, shows a band extending from D. 50—H. 170. Region of greatest absorption D. 68—H. 170. The same, plus caustic soda, gave a band extending from D. 52—H. 170.

Region of greatest absorption E. 82—H. 170.

Azobenzol Fast-Crimson.

Dissolved $\frac{1}{4}$ grm. in 1 litre of water and examined the spectrum. A band was obtained, extending from C. 46—H.170. Region of greatest absorption D. 52—H. 170.

The same diluted to 1 pt. in 40,000 showed a band extending from D. 50—H. 170. Region of greatest absortion D. 66—H. 170. The same, plus caustic soda, gave a band extending from C. 48—H. 170. Region of greatest absortion D. 64—H. 170.

From the above it will be seen, that the spectra of these colors, resemble one another so closely, that it is quite a difficult matter to recognize them with the spectroscope, and this can only be done by strictly adhering to the strength of solutions indicated. In conclusion I would state, that in working with very dilute solutions, I found that the absorption bands continually recede from the red toward the green and blue parts of the solar spectrum, until a certain dilution has been reached, when they disappear altogether. Acids but have little action upon the spectra while caustic soda produces a more marked effect.

ON THE ACTION OF DIAZO-β-NAPHTHALENE ON PHENOLS.

By J. H. STEBBINS, Jr.

Since the discovery, that β-naphthole could be converted into β-naphthylamine by the action of ammonia, under pressure, a new field for the production of azo-colors has been opened up. These compounds would, of course, be isomeric with those derived from α-naphthylamine, or rather diazo-α-naphthalene.

It has been mentioned by several writers that β-naphthylamine may be diazotized, and combined with phenoles, to form new azo-compounds, but in no case have any such compounds been described.

Being desirous of obtaining an insight into the nature of these bodies, I treated diazo-β-naphthalenechloride with such phenoles as I had at command, and obtained the following results :

Phenol-azo-β-naphthalene.

$$\beta\ C_{10}\ H_7 - N = N - C_6\ H_4\ OH$$

This compound was obtained as follows :

10.2 grms. β-naphthylamine were dissolved in 12.7 grms. HCl. (1.2 Sp. Gr.), diluted with 500 c. c. water at gentle heat filtered, and allowed to cool.

When cold, the solution was treated, under constant stirring, with 5 grms. Na NO_2 dissolved in 50 c. c. water.

The diazo-β-naphthalenechloride thus formed was allowed to rest for an hour, and then mixed with a solution composed of phenol 6.7 grms., Na OH 5.7 grms., and water 200 c. c. A brick-red precipitate was immediately formed. This was collected on a filter and allowed to dry. It was purified by dissolving it in NaOH and water, reprecipitating it with acetic acid, and finally crystallizing from benzene.

It is deposited from this solvent in groups of small, pale-yellow, cigar-shaped crystals, slightly soluble in cold water, and melting to a resinous mass in boiling water. It dissolves freely in caustic soda, from which it is reprecipitated unaltered by acids, is soluble in alcohol with a yellow color, and in strong sulphuric acid with a deep crimson color. Melting point about 100° C.

The body is probably formed according to the following equation:

$$\beta C_{10} H_7 \, N{=}N\text{-}Cl + C_6H_5 \, OH{=}\beta C_{10} \, H_7{-}N{=}N{-} \\ C_6H_4 \, OH + HCl.$$
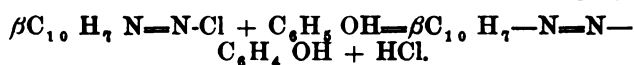
On heating one part of the dyestuff with 3 pts. of fuming sulphuric acid, on the water bath for about an hour, a sulpho-acid is formed. The melt is dissolved in water, neutralized with $CaCO_3$, and filtered from the Ca SO_4.

The filtrate, on being concentrated by evaporation, deposits when cold the acid lime salt of the new sulpho-acid as a network of microscopic needles, which by transmitted light appear yellow, and in reflected light red-brown.

Determinations of S and Ca prove this body to be the acid Ca salt of phenol-azo-β-naphthalenetrisulpho-acid.

$$\left\{ \beta C_{10} H_5 \overset{SO_3}{\underset{SO_3}{\diamond}} Ca{-}N{=}N{-}C_6H_4 (OH){-}SO_3 \right\}_2 = Ca + 3\tfrac{1}{2} H_2O$$
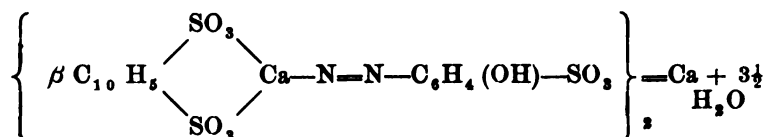
Found.

(1.) 0.8703 grm. substance lost on drying at 110°C. 0.0577 grm. of water, $=6.6\%=3\tfrac{1}{2}$ mols. H_2O.

(2.) 0.8126 grm. anhydrous salt gave 0.333 grm. Ca SO_4. Equivalent to calcium 0.097 grm. or Ca—11.93%.

(3.) 0.5 grm. anhydrous salt gave Ba SO_4 0.4648 grm. Equivalentto sulphur 12.76%.

Theory requires.

Calcium -- 12.87%
Sulphur -- 13.73%

Although the figures obtained are somewhat too low, yet I have no hesitation in pronouncing the new compound to be constituted as above set forth, as the figures obtained are too high for a disulpho-acid, and much too low for a tetrasulpho-acid, which requires 19.8% sulphur. The discrepancy in the figures is probably due to some impurity in the compound examined, which I had not perfectly removed. The free sulpho-acid (assuming the above to be correct) would, therefore, be represented by one of the following formulae:

1. $\beta C_{10} H_5 (HSO_3)_2{-}N{=}N{-}C_6H_3 (HSO_3) OH.$
2. $\beta C_{10} H_6 (HSO_3){-}N{=}N{-}C_6H_2 (HSO_3)_2 OH.$

Which of the above two formulae is the correct one, I have thus far not been able to decide. The formation of a diazo-compound was not observed.

Orthocresol-azo-β-naphthalene.

$$\beta \, C_{10} \, H_7 - N = N - C_6 H_3 \, (CH_3) \, OH.$$
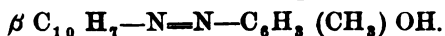
10.2 grms. β-naphthylamine were diazotized with 12.7 grms. H Cl (1.2 Sp. Gr.) and 5 grms. sodium nitrate, and the solution thus obtained, after resting for an hour, was added to a solution composed of ortho-cresole 7.7 grms., caustic soda 5.7 grms. and water 200 c. c. A copious, brownish-yellow, precipitate was immediately formed. It was collected on a filter, washed and dried. It dissolves in toluene, ether, petroleum ether, alcohol, and glacial acetic acid, but does not crystallize from any of these solvents. It is soluble in caustic soda, and is reprecipitated unaltered by dilute acids. It melts in boiling water to a resinous mass, undergoing at the same time partial decomposition. Heated on the water bath with fuming sulphuric acid, it undergoes total decomposition, so that a sulpho-acid could not in this case be produced. For lack of material I was unable to analyse it, but have no doubt that it is formed according to the following reaction :

$$\beta C_{10} H_7 \, N = N - Cl + C_6 H_4 \, (CH_3) \, OH = \beta \, C_{10} H_7 - N = N - C_6 H_3 \, (CH_3) \, OH.$$
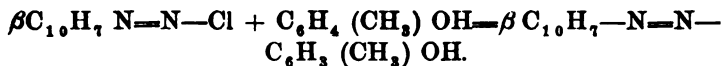
Owing to the unsatisfactory nature of this body, it was not further investigated.

Resorcin-azo-β-naphthalene.

$$\beta \, C_{10} \, H_7 - N = N - C_6 \, H_3 \, (OH)_2$$
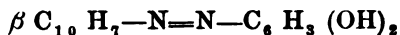
10.2 grms. β-naphthylamine were dissolved in 12.8 grms. H Cl (1.2 Sp. Gr.) diluted with 500 c. c. water, and diazotized with 5 grms. Na NO$_2$. The β-diazonaphthalenechloride thus obtained was added, under constant stirring, to a solution composed of resorcine 7.8 grms., caustic soda 5.7 grms. and water 200 c. c. A red-brown precipitate was immediately formed. This was collected on a filter, washed, dried, and finally treated with caustic soda, which dissolves a part of the precipitate. The insoluble residue was washed, dried, and set apart for further examination. The filtrate was acidified with HCl, which threw down a yellow-brown precipitate ; this precipitate is the acid, soda salt of resorcin-azo

β-naphthalene. It was collected on a filter, washed with cold water, dried, and dissolved in alcohol, from which on cooling it crystallises in bunches of microscopic, yellow needles, which melt at 200° C., undergoing total decomposition. This compound probably has the following formula, and agrees very closely with the figures obtained by analysis :

Acid sodium salt of resorcin-azo-β-naphthalene.

$$\beta\ C_{10}\ H_7-N=N-C_6H_3 \begin{matrix} \diagup ONa \\ \diagdown OH \end{matrix} + 1\ C_2\ H_6O.$$
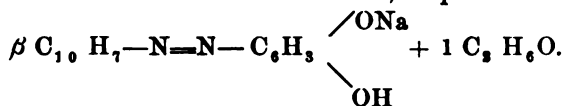
Found.

Nitrogen 9.53%

Theory.

Nitrogen 9.79%

It crystallizes with one molecule alcohol of crystallization, as will be seen from the analysis.

0.463 grm. substance lost on drying at 110°C. .002 grm. alcohol, —0. 45%, — 1 mol. C_2H_6O. The free acid would, therefore, have the formula

$$\beta\ C_{10}\ H_7-N=N-C_6H_3 \begin{matrix} \diagup OH \\ \diagdown OH \end{matrix}$$
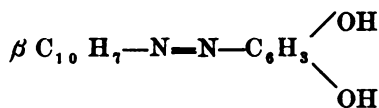
On being heated with 3 pts. of fuming sulphuric acid on the water bath for 3 hours, a sulpho-acid is formed, which, for want of time, I have not further investigated.

The residue insoluble in caustic soda, referred to above, was dissolved in alcohol, which, on being concentrated, deposited the new compound, in the shape of flat, reddish-brown prisms. Melting point 143–144^c. It was first thought that this substance might be a diazo-compound, but a nitrogen estimation proved this not to be the case.

Found

Nitrogen 4.4%

Theory for

$$\begin{matrix} C_6H_5-N=N \diagdown \\ \qquad\qquad C_6H_2(OH)_2 \\ C_6H_5-N=N \diagup \end{matrix}$$
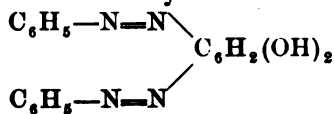
Nitrogen... 13.4

The exact nature of this compound I have as yet not discovered, but hope to do so in future.

ON BETAPHENANTHROLMONOSULPHO-ACID.

By Wm. Rupp.

This acid was prepared by heating one part of β phenanthrol (Morton and Geyer, Jour. Am. Chem. Soc., II., 205) with two parts of sulphuric acid, on the water bath for five hours. The resulting product was dissolved in water, neutralized with lead carbonate, and the sulpho-acid set free, by precipitating the lead with sulphuretted hydrogen. The free acid, $C_{14}H_8$ (HSO_3) OH is soluble in water, alcohol and ether, but could not be obtained in a crystalline form. After the solvent had evaporated it always formed a black, pitch-like mass, even when the concentrated solution was quite light in color. All attempts to decolorize it were unsuccessful.

The lead salt is slightly soluble in cold water, and quite soluble in boiling water.

With an excess of barium hydrate, a light grey amorphous precipitate is formed, which was found to be the neutral barium salt.

$$C_{14}H_8 - SO_3 \!-\!\!-\! O\diagdown$$
$$\diagup\!\!\!\diagdown Ba \quad Ba$$
$$C_{14}H_8 - SO_3 \!-\!\!-\! O\diagup$$

Theory,	Ba	44.1
Found,	Ba	42.5
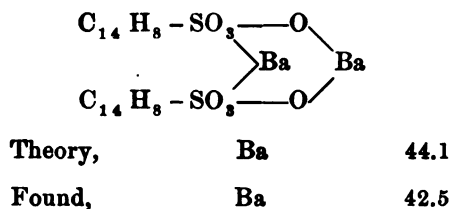
The barium salt is insoluble in cold and boiling water and in acids.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

On Faraday's Law. M. BERTHELOT.

Equal electric currents, passing through electrolysable salts, separate in equal times weights of the several metals proportional to their equivalents. Thus the same current precipitates at the negative pole 107·9 grammes of silver ; 103.5 of *lead ; 39.1 of potassium ; 68.5 grammes of barium. To make them proportional to atomic weights, there should be for 107.9 grammes of silver, 207 of lead, *i. e.*, double the weight actually thrown down. Also for 39.1 grammes of potassium, there should be 137 gr. of barium, which is not the case. In the same manner for electro-negative elements, the weights separated are 35.5 of chlorine, 8 of oxygen, and not 16 of oxygen.

The idea of plurivalence is older than the new atomic notation. This idea is the same for chemists who use equivalent weights, as for those who prefer atomic weights, and has nothing to do with the fact that Faraday's law is expressed more simply by equivalents than by atomic weights, in the case of electro-positive, as well as in the case of electro-negative elements. (*Comptes Rend.* XCVIII. 264.)

P. C.

Note on Faraday's Law. A. WURTZ.

In the interpretation of Faraday's law, atomic weights do not enter; the question is one of *valency*. The weights of plurivalent metals deposited at the negative pole do not agree with the *equivalents*. In the electrolysis of cuprous chloride, for 35.5 of chlorine at the positive pole, 63.5 of copper are deposited on the negative pole, and this number is not the *equivalent* of copper. In the electrolysis of bismuth chloride, 70 of bismuth are deposited. This number is not the equivalent of bismuth.

M. Wurtz adds: " Mr. Berthelot accepts this statement. If he prefers, in interpreting Faraday's law, to use numbers established forty years ago, which, in the case of plurivalent elements, do not represent equivalent quantities, it is only a question of personal choice, and I have nothing to object."

(*Comptes Rend.* XCVIII. 321.)   P. C.

Liquefactions of Hydrogen. S. WROBLEWSKI.

Hydrogen is compressed to 100 atmospheres, in a vertical tube of 2 millimetres, exterior diameter, and from $\frac{2}{10}$ to $\frac{4}{10}$ mm. interior diameter. A screw permits release of pressure more abruptly than in M. Cailletet's apparatus. After cooling the tube by a succession of ebullitions of oxygen, the author noticed, in the hydrogen tube, when the gas expands, an ebullition analogous to that observed by M. Cailletet in oxygen. It takes place a short distance from the bottom of the tube, but is less distinct, because of the feeble density of liquid hydrogen.

In discussing this paper, M. Cailletet said that he had compressed hydrogen at 300 atmospheres. On expansion a thin fog was visible throughout the entire tube, showing liquefaction of hydrogen. (*Comptes Rend.* XCVIII. 304.)

P. C.

Heat of Formation of Fluoride, Chloride and Oxychlorides of Antimony. M. GUNTZ.

From the thermochemical results obtained, the author concludes that a definite compound, $SbF_3.3$ HF forms, which, however, he has as yet been unable to isolate.

The heat of formation of $Sb\,Cl_3$ from the oxide was found to be $47^{\circ}.4$ cal. The oxychloride $Sb\,O_2\,Cl$, formed in the same manner corresponded to the highest thermal effect. Attempts to prepare a pure hydrate, $Sb\,O_3$, 3 HO, were unsuccessful. (*Bul. Soc. Chim.* XLI., 370.)

E. W.

Russian Chemical Society. Correspondence of O. DAVIDOFF.

M. Tchijeosky has investigated the volatilization of salts by evaporation of their aqueous solutions with regard to some alkaline carbonates. The conclusions are, 1st, That the amount of salts removed with the aqueous vapor are sometimes quite considerable. 2d, That the volatilization of the salt increases with the concentration of the solution up to a maximum, after which it diminishes. It is *nil* for the dry salt (at 100°). 3d, The volatilization increases with the increase in molecular weight of the salt. Thus it is so small for lithum salts that it could not be determined, and is greater for sodium potassium and rubidium salts.

M. Prokofieff notes analogy between B and C_2H_3 thus B_2O_3 and acetic anhydride $(C_2H_3)_2O_3$; $Na_2B_4O_7$ and $K_2(C_2H_3)_4O_7$, the salt obtained by combination of acetic anhydride with postassium acetate; B N and acetonitrile, C_2H_3N. Thus far the author has not been able to prepare B N.

M. Lubavine gives the analysis of a phosphorite of Nijni Novgorod. Dried at 110° the results were as follows :

Hygroscopic moisture	2.13
Organic substance	0.61
Silica soluble in soda solution	5.84
Residue insoluble in H Cl and in soda, (principally Si O_2)	8.99
CO_2	4.13
P_2O_5	25.46
SO_3	0.09
CaO	35.49
MgO	0.61
MnO	0.16
Fe_2O_3	4.42
Al_2O_3	4.99
Na_2O	0.72
K_2O	0.59
CaF_2	4.16
	98.39

(*Bul. Soc. Chim.*, XLI., 390.)   E. W.

On Haydenite. H. N. MORSE and W. S. BAYLEY.

Haydenite from the gniess quarries near Baltimore, was found to contain 1.46–1.46% of BaO, a constituent not previously reported in this mineral. A complete analysis is given. Haydenite is considered by the authors to be identical in composition, crystalization and physical properties with chabazite. (*Am. Chem. Jour.*, 6, 24.)
                    A. A. B.

The Physiological Effect of Boracic Acid. J. FORSTER.

An abstract from the Berichte (1883, p. 1754.) Taken with the food in small doses 0.5 — 3.5 grms. per day B_2O_3 increases the proportion of solid excrements and increases also the proportion

of N and dry substance in these. The effect is to carry off albuminous matters by making them insoluble, possibly also the wear of the intestines is greater, a greater quantity of epithelium, etc., being therefore carried off. Separation of gall is notably increased The use of boracic acid is especially to be avoided in connection with milk and egg foods, and especially in the case of children or sucking infants. (*Ding. Pol. J.* **251, 170.**)   A. A. B.

On the Physiology of the Carbohydrates in the Animal System. F. W. PAVY.

By a series of experiments it is found that the ferment which effects the transformation of glucose into a body of lower copper-reducing power resides principally in the paunch, reticulum and third stomach (many plies) of the sheep, the fourth, or true stomach, yielding little of this ferment, and the intestines none at all. The results were obtained by artificial digestion of the carbohydrate in question with portions of the stomach, etc., of recently killed animals. The minimum copper-reducing power in a product of digestion of glucose was one in which this power was to that of glucose as 40 to 100. In contradiction of the statement of Bernard, digestion of cane sugar is found to take place, although in lesser degree, in the *stomach* and is *not* confined to the small intestine. In the ruminants this function resides almost exclusively in those parts of the digestive apparatus anterior to the true stomach. With large quantities of the ferment, cane sugar is wholly inverted, but with reduced quantity or time of exposure maltose, dextrine or unchanged cane sugar are found. Cane sugar was distinguished from maltose in the products by its ready inversion on boiling with weak (2%) solution of citric acid. Maltose requires sulphuric acid for inversion. Cane sugar taken into the stomach is not found as such in the portal blood nor as glucose, but as a product of lower reducing power approximating that of maltose. (*Chem. News.* XLIX. 154, *et seq.*)   A. A. B.

ORGANIC CHEMISTRY.

On some Derivatives of Hydrindonaphthene. ADOLF BAEYER and W. H. PERKIN, JR.

By treating orthoxylene bromide with the sodium salt of malonic acid ether, both the methyl groups of xylene unite with the middle carbon atom of a malonic acid ether, forming the ether of a dicarbo-acid which contains two hydrogen atoms more than indonaphthene, and which the authors call hydrindonaphthene.

The formula of this compound may be expressed as follows :
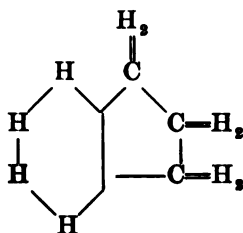
The authors likewise produced hydrindonaphthonemono- and dicarbo-acids. (*Ber. d. Ch. Ges.* 1884, 122.)   J. H. S. Jr.

On the Action of Hydroxylamine on Nitriles. FERD. TIEMANN.

An aqueous solution of hydroxylamine chloride on being shaken up with a concentrated ethereal solution of benzaldehydecyanhydrine, deposits after a while,crystals, the yield of which is increased by several days shaking of the mixture. The compound thus formed was found to have the formula $C_8 H_{10} N_2 O_2$ and is therefore simply an addition product of benzaldehydecyanhydrine and hydroxylamine. This compound has the properties of an amido-acid, as it is dissolved readily both by acids or alkalies.

Hydroxylamine chloride and benzonitrile unite under similar circumstance to form the addition product $C_7 H_8 N_2 O$.

This compound has properties similar to the previous one.

(*Ber. d. Ch. Ges.* 1884, 126.)   J. H. S. JR.

On p-Azo-kresol.   C. Liebermann and St. v. Kostanecki.

The general impression that the azo-group in combining with the phenole, takes up the para-position in relation to the hydroxyl, has been found to be erroneous, as the authors were able to produce an azo-compound directly from p-cresol, in which the para- position is already occupied by the methyl group. In this case, therefore, the azo-group would have to take up another position.

Phenyl-azo-p-cresol

$$C_6 H_5 - N = N - C_6 H_3 \diagup^{O H (1)}_{\diagdown C H_3 (4)}$$
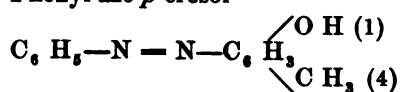
This compound is formed by the action of diazobenzole on p-cresol. It crystallizes in little leaflets with golden lustre. Melting point 108° C.

Phrenyl-azo-(o)-cresol.

$$C_6 H_5 - N = N -_6 C H_3 \diagup^{O H (1)}_{\diagdown C H_3 (2)}$$
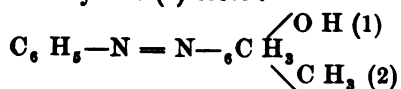
Prepared by the action of diazobenzol on orthocresol. Crystalizes in little leaflets or needles, with golden lustre. Melting point 128–130° C. (*Ber. d. Ch. Ges.* 1884, 130.)   J. H. S. Jr.

On a Blue Dyestuff from Pyrrol.   G. L. Cimician and P. Silber.

By treating pyrrole with an aqueous solution of isatine and dilute sulphuric acid, the authors obtained a blue dyestuff. It was found, however, that glacial acetic acid was preferable to the sulphuric acid.

2 pts. isatine were dissolved in 50 pts. warm glacial acetic acid and added to the boiling solution of 1 pt. of pyrrol. The mixture turns dark blue and on being poured into cold water and neutralized with sodium carbonate it is obtained in the shape of a fine powder.

The analysis leads to the formula $C_{24} H_{18} N_4 O_3$

(*Ber. d. Ch. Ges.* 1884, 142.)   J. H. S. Jr.

Preliminary Communication. H. KILIAN and S. KLEEMANN.

The authors state that by treating gluconic acid with strong hydrobromic acid, it is converted into normal caprolactone.
(*Ber. d. Ch. Ges.* 1884, 143. J. H. S. JR.

On the Behavior of Diamines with Nitrous Acid. A. LADENBURG.

The author in a former paper had shown that orthophenylendiamine on being treated with nitrous acid forms azimidobenzole, whereas metaphenylendiamine under the same circumstances forms phenylene brown. Paraphenylendiamine, which he had not previously examined, forms the subject of this paper.

Paraphenylendiamine was converted into diacetyl paraphenylendiamine. This with nitric-acid gave nitrodiacetylparaphenylendiamine, which on being boiled 15 minutes with fuming HCl, splits up into nitrophenylendiamine. If a dilute sulphuric acid solution of this substance be treated with KNO_2, a brown, amorphous precipitate is formed which has no similarity to the bodies derived from the other phenylendiamines.

Paraphenylendiamine in dilute HCl solution, on being treated with KNO_2, is changed very little at first, but after standing a long time yields a brown, amorphous precipitate with the formula $C_{12}H_{12}N_2O_3$. (*Ber. d. Ch. Ges.* 1884, 147.) J. H. S. JR.

Synthesis of Piperidine. A. LADENBURG.

The author finds that piperidine is obtained from pyridine by treating its alcoholic solution with sodium. The yield is small.
(*Ber. d. Ch. Ges.* 1884, 156.) J. H. S. JR.

On 1 : 2 : 4 : Orthoxylidine. OSCAR JACOBSEN.

Nitroorthoxylol was first prepared by treating pure orthoxylol with 8 times its weight of fuming nitric acid. It crystallizes from alcohol in light yellow prisms. Melting point, 29° C. This on reduction with iron filings and acetic acid, or with tin and hydrochloric acid, gave orthoxylidine. ($C_6 H_3 \overset{1}{C} H_3. \overset{2}{C} H_3. \overset{4}{N} H_2.$)

This compound crystallizes in tables. Melting point, 49°. Boiling point, 226° C. (*Ber. d. Ch. Ges.* 1884, 159.) J. H. S. JR.

On Nitroorthotoluic Acid. OSCAR JACOBSEN.

This compound was obtained by oxydizing 25 grms. of nitro-orthoxylol with 250 c. c. nitric acid (sp. gr. 1.4) diluted with 500 c. c. water. The mixture is heated with return cooler for 48 hours. Two nitroorthotoluic acids are thus formed.

One of them melts at 179° C. The second acid melts at 152° C., and is designated by the author as γ-nitroorthotoluic acid.

(*Ber. d. Ch. Ges.* 1884, 162.)   J. H. S. JR.

Action of Methylene Chloride on Toluene and Benzene. C. FRIEDEL and J. M. CRAFTS.

With methylene chloride and toluene in presence of aluminium chloride, the principal products of the reaction were ditolylmethylene and dimethyl anthracene. No hydrogen was evolved, but small amounts of para- and metaxylene were found to have been produced. On substituting benzene for toluene, diphenylmethane and anthracene were formed, as also some toluene. The experiments are still in progress. (*Bul. Soc. Chim.*, XLI., 322.)   E. W.

On two Campholurethanes, physically isomeric, analogous to the right and left Tartaric Acids of M. Pasteur. A. HALLER.

Fifty grammes of camphol of Ngai, dissolved in 150 grms. of toluene, are treated with 6 grms. of sodium. When almost all of the sodium has entered into combination, a current of dry cyanogen is passed in until the liquid begins to be colored. After agitating with water, and decanting, the mixture is distilled. The solid mass remaining is heated to 100° and the borneol which has not been acted upon passes off and sublimes. By extracting the residue with boiling water, the urethane is removed, and the residue, by extraction with alcohol, affords left-handed borneol carbonate. The left-handed urethane is deposited from the boiling water in fine needles. It fuses at 126–127° C. and the solutions rotate the polarized ray to the left, α. (D.) $=$ —29.90°. The crystals of the right and left-handed campholurethane are compared. In the formation of these compounds borneol carbonate is always formed. Another derivative is also formed in the reaction, which is but slightly soluble in alcohol and ether. This compound appears to

have no analogous right-handed compound. Further study of this compound is proposed. (*Bul. Soc. Chim.*, XLI., 327.) E. W.

Note on Ethyl- and Methylacetylcyanate of Ethyl. A. HELD.

After preparing ethyl- and methylacetylacetic ethers by the process of Conrad and Limpach, these products were treated with sodium ethylate, and the solution saturated with dry cyanogen chloride ; the result was the formation of ethyl- and methyl-acetylcyanates of ethyl. The ethyl compound boils at 105° to 110° under a pressure of 15 to 20 mm. mercury ; it is a colorless liquid with a pleasant, ethereal odor; Sp. Gr. 0.976 at 20°, soluble in alcohol and ether, and insoluble in water and alkaline solutions. The methyl compound is similar in solubility, etc., to the above. Sp. Gr. 0.996 at 20°. Boils at 90° to 95° under pressure of 15 to 20 mm. mercury. (*Bul. Soc. Chim.*, XLI., 330.) E. W.

On the Oxidation of Menthol by Potassium Permanganate. G. ARTH.

By the action of potassium dichromate and sulphuric acid, Morija obtained a compound, $C_{10} H_{18} O$, which he called *menthone*. By the use of potassium permanganate and sulphuric acid, according to a method here described, the author obtained a substance which had a strong odor, recalling somewhat that of valerianic acid. It appeared to be a mixture of at least two acids, one of which was apparently $C_{10} H_{18} O_3$. The second acid has not yet been isolated for examination. (*Bul. Soc. Chim.*, XLI., 330.) E. W.

On the Preparation of a Propyl and an Amyl Naphthalene. L. ROWX.

A mixture of 200 gms. of naphthalene with 120 gms. propyl bromide are heated together in a flask with an inverted condenser. When distillation begins, about 10 grms. aluminium chloride are added, a little at a time, the flask being agitated during the addition. Hydrobromic acid is disengaged abundantly, and these vapors are condensed in a tared flask. The heating is continued, and when the amount of hydrobromic acid evolved is nearly the theoretical amount, the flask is allowed to cool; 3 to 400 grms. $C S_2$ are added to complete solution, the products are treated with water, the $C S_2$ is decanted, and the material is dried and distilled

fractionally *in vacuo*. The main portion consists of a product $C_{10} H_7 (C_3 H_7)$ boiling at 262°—267° at ordinary pressures ; vapor density (Meyer's method) 5.85. Probably isopropyl naphthaline. By substituting amyl chloride for propyl bromide in the above process amyl naphthalene, $C_{10} H_7 (C_5 H_{11})$, was obtained, boiling at 288°—292°. The above formed compounds with picric acid, the propyl compound fusing unchanged at 89° to 90°, the amyl compound also fusing unchanged at 140° to 141°.

Small amounts of isodinaphthyl were produced, which appeared to be formed in consequence of the presence of an alcoholic chloride. (*Bul. Soc. Chim.*, XLI., 319.)   E. W.

Action of Chlorinated Aldehydes on Benzene. A. Combes.

To a solution of chloral in excess of benzene, aluminium chloride was added in small portions. A perceptible reaction took place in the cold, and on heating to about 70° much HCl was evolved. By washing with water and distilling off the benzene, a compound remained, distilling *in vacuo* at 175°—185°, colorless when distilled, quite viscous, and with pleasant, aromatic odor; $C_6 H_5 CCl_2$, COH, HCl. Distilled in the air it loses HCl and gives, consequently, a boiling point varying between 265° and 290°. It reduces Fehling's solution and $AgNO_3$ and combines with difficulty with sodium bisulphite. KHO in the cold removes from it the HCl; heated, it affords benzoic aldehyd.

An attempt to obtain other aldehydes by the action of the aluminium chloride upon the chloral in benzene was unsuccessful, the product being either triphenylethane or tetraphenylethylene, the latter point remaining unsettled. (*Bul. Soc. Chim.*, XLI., 382.)   E. W.

On the Synthesis of Dimethylanthracenehydride and Diphenylethane. A. Angelbis and R. Anschütz.

On heating ethylidene chloride or bromide and benzene, with aluminium chloride, diphenylethane was formed, according to the following reaction :

$$\begin{array}{c} CHCl_2 \\ | \\ CH_3 \end{array} + 2 C_6 H_6 \qquad \begin{array}{c} CH(C_6 H_5)_2 \\ | \\ CH_3 \end{array} + 2 HCl$$
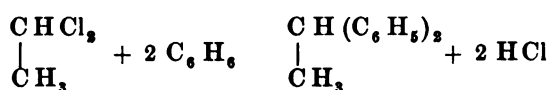
This compound boils at 150°. It is colorless, but has a blue fluorescence. The analysis of the picrate of this hydrocarbon showed that it has the formula $C_{16}H_{16}$, obtained according to the following reaction, $2\ CH_3\ CHCl_2 + 2\ C_6H_6 = C_{16}H_{16} + 4\ HCl$. The pure hydrocarbon melts at 178°—179° and sublimes in transparent, light yellow, flat needles. It is easy soluble in ether, benzene, carbon disulphide, hot glacial acetic acid, and alcohol.

On oxidation with an excess of chromic acid, it splits up into anthrachinone and carbon dioxide. Taking these facts into consideration, the body would have the following structural formula :

$$
\begin{array}{c}
CH_3 \\
| \\
CH \\
\diagup\ \ \diagdown \\
C_6H_4 \qquad C_6H_4 \\
\diagdown\ \ \diagup \\
CH \\
| \\
CH_3
\end{array}
$$
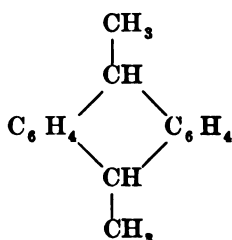
The picrate of this new hydrocarbon, is represented by the formula, $C_{16}H_{16} - C_6H_2(NO_2)_3 - OH$. Crystallizes in reddish blue needles, melting point 170° C. (*Ber. d. Ch. Ges.* 1884. 165.)

J. H. S., Jr.

On the action of **Aluminium Chloride on Vinyl bromide in Benzene, and Vinyl tribromide in Benzene.** A. ANGELBIS AND R. ANSCHÜTZ.

On passing a uniform current of vinyl bromide through a mixture of benzene and aluminium chloride, and then distilling the mixture, the following compounds were obtained :

1. Ethylbenzene. 2. Diphenylethane. 3. Dimethylanthracene-hydride.

The authors expected that by treating vinyl tribromide in the same manner they would obtain triphenylethane, but they were unable to isolate this compound. The only product they could separate was, strange to say, diphenylethane. (*Ber. d. Ch. Ges.*, 1884. 167.)

J. H. S., Jr.

Remarks on the Previous Communication. R. ANSCHÜTZ. (*Ber. d. Ch. Ges.*, 1884. 169.)

J. H. S., Jr.

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E.

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An attempt to obtain other aldehydes by the act aluminium chloride upon the chloral in benzene was : the product being either triphenylethane or tetraph the latter point remaining unsettled. (*Bul. Soc. Chin*

On the Synthesis of Dimethylanthracen Diphenylethane. A. ANGELBIS AND R. ANSCH

On heating ethylidene chloride or bromide at aluminium chloride, diphenylethane was formed, following reaction :

$$CHCl_2 + 2 C_6 H_6 \quad CH(C_6H_5) \\ | \\ CH_3 \qquad \qquad CH_3$$

On the Synthesis of Anthrachinoline. C. GRAEBE.

This investigation was undertaken, with the view of determining whether the same compound would be obtained by heating anthramine, nitrobenzol and sulphuric acid together, as that derived from alizarine blue, by heating it with zinc dust. This, on experiment turned out to be the case, for on heating anthramine, glycerine, nitrobenzol and sulphuric acid together, an anthrachinoline melting at 170° C. was obtained. (*Ber. d. Ch. Ges.* 1884. 170.) J. H. S., JR.

On Sinapic Acid. I. REMSEN and R. D. COALE.

Sinapine, a base existing as sulphocyanate in the alcoholic extract of mustard seed, was made to yield the above acid by boiling with baryta water instead of with caustic potash as in the original method of von Babo and Hirschbrunn. The product crystallized from a mixture of alcohol and water in small, yellowish, transparent prisms fusing at 192°, and yielding, on analysis, results which accord best with the formula $C_{11}H_{12}O_5$, originally given by v.B. and H. Analysis of Ca and Ba salts indicate that it is a monobasic acid, with one hydroxyl. Fused with caustic potash it yields a body giving the reactions of pyrogallol. The authors believe sinapic acid to be a derivative of gallic acid, probably butylene gallic acid, and are endeavoring to effect its synthesis. (*Am. Chem. Jour.*, **6**, 50.) A. A. B.

Russian Chemical Society. Correspondence of O. DAVIDOFF.

M. Koutcheroff finds in regard to action of allylene on mercuric oxide and its salts, 1. That in acid solutions substances are formed which generate acetones by the action of acids. They may be considered as combinations of basic salts with C_3H_4HgO. In alkaline solutions a substitution product of $(C_3H_3)_2Hg$ is formed which affords allylene by the action of acids. 2. That hydration of allylene is only a special case of the above reaction. At an elevated temperature it is continuous, complex mercury compounds being formed which decompose with formation of acetone. 3. That the structure of the acetones formed depends upon that of the hydrocarbons from which they are derived. The rules for their formation are given. (*Bul. Soc. Chim.*, XLI, 388.)

E. W.

ANALYTICAL CHEMISTRY.

On the Reversion of Phosphoric Acid. T. S. GLADDING.

The author has previously shown that the reverted phosphates of commercial superphosphates contain iron and aluminium, as well as calcium, but that the reverted phosphates of the two former metals are soluble in ammonium citrate, only at 65° C, while reverted calcium phosphates dissolves completely at 40° C. These properties are used to distinguish the different phosphates in the work now described.

Neutral ammonium citrate is found to act least upon the insoluble phosphates present.

The fact of reversion of phosphoric acid in soils by iron and alumina was established by a series of experiments, in which natural and artificial soils were treated with solutions of phosphates of known strength, and after exposure to air and drying for several days, were examined for reverted phosphates of iron and alumina. A method for analysis of superphosphates is added. (*Am. Chem. Jour.*, 6, 1.) A. A. B.

On the Determination of Nitrogen by Combustion with Calcium Hydroxide. S. W. JOHNSON.

Pure slaked lime, dried at a moderate heat to remove excess of moisture, is now used instead of the mixture of sodium carbonate and lime heretofore used by the author. The anterior layer of pure lime should be somewhat longer than the mixture of lime and substance and should be heated to full redness before heating the mixture. The tube is allowed to cool below redness before aspiration. Reddening of acid in the bulb is rare when pure lime is used. Standard NH_3 and HCl are used, with cochineal as indicator. Determinations of nitrogen in many substances were made by the old and new methods respectively; the results agree very well. (*Rep. Conn. Ag. Exp. Station*, 1883.) A. A. B.

Note on the Analysis of Soils. A. GUYARD.

For *easily assimilable elements* treat 100 gms. of the soil in the cold with a cooled mixture of 150 c.c. of HCl and 150 c.c. of

water. Filter; wash first with cold, finally with boiling water, and determine the lime, magnesia, alkalies and phosphoric acid in solution. For assimilated elements, calcine, 100 grms. of soil at as low a temperature as possible, cool, treat, cold, with 300 c.c. dilute HCl, and proceed as before. The difference between the results of the first and those of the second analysis represents the assimilated elements contained in the organic matters of the soil.

A third analysis on the material extracted from the soil by boiling *aqua regia* may be of advantage as a check upon the other two. (*Bul. Soc. Chim.* XLI, 384.)   E. W.

Note on the Determination of Ammoniacal Nitrogen in Soils. A. GUYARD.

The ordinary method of using 2 to 4 grms. magnesia to 100 of the soil gives not only ammonia actually existing in the soil, but also some of the ammonia due to organic nitrogen present. It is recommended to take the amounts of the reagents given below per 100 grms. of soil for separate determinations. For ammoniacal nitrogen, calcium carbonate 10 grms.; organic nitrogen readily transformable into ammonia, magnesia subcarbonate 5 grms.; nitrogen tolerably easily converted into ammonia, calcined magnesia 2 grms.; nitrogen transformable into ammonia, calcined lime 1 grm.; second portion of nitrogen transformable into ammonia, caustic potash or soda 0.5 to 1 grm.; finally organic nitrogen by combustion with soda lime. (*Bul. Soc. Chim.*, XLI., 337)   E. W.

Note on the Separation and Determination of Lime, even in Presence of great Excess of Alumina, Magnesia, Ferric Oxide and Phosphoric Acid. A. GUYARD.

After addition of an excess of ammoniacal ammonium citrate, the lime can be precipitated by ammonium oxalate, free from the other substances here mentioned. If a small amount of silica is in solution, it will be partially precipitated, carrying with it some iron and ammonia. If the precipitation is effected at 70° to 80°, no magnesia will be found in the precipitate, though phosphoric acid may be present. Calcium oxalate is soluble in a mixture of acetates and acetic acid even when dilute. (*Bul. Soc. Chim.*, XLI., 339.)
                                            E. W.

On a New Volumetric Method for the Estimation of Nitrous Acid. A. G. GREEN AND S. RIDEAL.

The method depends upon the formation of diazo-benzol by action of nitrous acid on aniline. A decinormal solution of pure aniline is used, containing rather more than twice its equivalent of acid, half of the latter being sulphuric and half hydrochloric acid. The nitrate in a solution between decinormal and centinormal strength, is added in a series of rough experiments to constant quantities of the aniline solution until a result is obtained in which iodide-starch solution yields only a faint blue coloration. From this approximative result an accurate titration is made. The standard aniline solution should be diluted with about four times its volume of water, and the whole solution in the final titration should be about decinormal. The process has been tested with pure sodium nitrate and found accurate within 0.1%. Apart from its delicacy it is applicable to cases in which the presence of oxidizable substances forbids the use of the permanganate process. (*Chem. News* XLIX., 173.) A. A. B.

Some Remarks on the Determination of Hardness in Waters. H. JACKSON.

The author finds that the difficulty experienced in determination of hardness of water by Clark's method, when salts of magnesia are abundant in the water to be tested, may be overcome by heating the water to 70° C. without the necessity of dilution, which is the common expedient in such cases. Also he finds that by the use of solution of sodium oleate instead of soap, a satisfactory result is obtained in presence of magnesia salts in excess, without either dilution or heating. (*Chem. News* XLIX., 149.) A. A. B.

Analysis and Composition of Beeswax. O. HEHNER.

3-5 grm. of wax are dissolved in 50 c.c. methyl alcohol, and the cerotic acid is titrated with an alcoholic potash solution, corresponding to 0.3 or 0.4 c.c. of normal $H_2 SO_4$ for each c.c. After an excess of potash solution has been added, the myricin is saponified and calculated from the potash used on the basis of 1 c.c. normal alkali to 0.4 grm. of cerotic acid or to 0.676 grm. of myricin.

English wax contains, on an average, 14.40% cerotic acid and 88.9% myricin. The organic adulterations of wax are either stearic

or palmitic acids, stearin or palmitin, Japan or carnauba wax, spermaceti paraffin, &c.

Fat acids increase the neutralization co-efficient of the wax, and neutral fats lower it.

One part of stearic acid = 1.443·of cerotic acid, 1 part of a mixture of palmitin and stearin corresponds to 2.391 of myricin.

Japan wax contains palmitic acid and palmitin, spermaceti, being equal in value to the best wax, scarcely comes in question. Carnauba wax contains 6.09 % cerotic acid and 92.08 % myricin. It is used as an adulteration along with fat. Paraffin, when used alone as an adulteration can be detected by corresponding loss of neutralizing power in the sample. When other substances are present the proportion of pure wax is calculated after determination of cerotic acid as above, by multiplying the latter by 6.117 for myricin. Specific gravity of the waxes varies between .9625 and .9675. Paraffin and fats are lighter, rosin and fat acids are heavier. Paraffin .9171, rosin 1.0865, fat acids 1.002. (*Ding. Pol. J.* 251.170.) (*Analyst,* 1883, 16)   A. A. B.

On a New Reaction of Ethyl Carbonate. G. ARTH.

By boiling ethyl carbonate with alcoholic potash in a vessel provided with a reversed condenser, potassium cyanate in considerable quantities was produced. Judging from his own and M. Haller's experiences, the author regards the reaction as a general one for all carbonic ethers. (*Bul. Soc. Chim.,* XLI., 334.)   E. W.

Note on the Action of Air on Solutions of Tannin, and on the Examination of Tannins. A. GUYARD.

Contrary to the assertions in some of the literature of the subject, solutions of tannin do not absorb oxygen and form gallic acid. The presence of a ferment is necessary to effect the transformation ; an alkaline solution of tannin absorbs oxygen rapidly. Lead acetate acidulated with acetic acid can be used to separate tannic from gallic acid. The lead tannate is completely insoluble in this reagent, while the gallate is soluble. The lead may be removed from these compounds by sulphuric acid, and the acids titrated separately with permanganate. (*Bul. Soc. Chim.,* XLI., 336.)   E. W.

INDUSTRIAL CHEMISTRY.

On the Gases Occluded in Cast Steel.

A review of recent work upon this subject, showing the present state of knowledge in regard to the relation between the composition of steel and the proportion of occluded gas or the occurrence of bubbles in its mass. The occluded gases consist largely of H and CO. The questions of relative affinity of Mn for C and Si at different temperatures and the influence of Mn and Si upon upon the retention of H in steel and the variation of such influence with temperature are discussed. Basic steel, according to Muller, contain mainly H and N, with little CO. The addition of spiegel or ferro manganese causes a reaction which produces CO, and this gas is absorbed by the steel to be set free at the moment of solidification. The discordant views of Muller and Pourcel in regard to the influence of Si in promoting the absorption of H, are reconciled in part by the observation of Brustlen, who finds that Si and Mn increase the permeability of steel for H, and so permit its escape without the production of bubbles. (*Ding. Pol. J.* 251.91) A. A. B.

On the Properties of Certain Salts of Iron and Aluminum with Reference to their Use in Dyeing. L. LIECHTI and W. SUIDA.

A determination of the facility with which these salts were dissociated with liberation of acid and deposition of insoluble basic compounds under the influence of heat, dilution or the attraction of vegetable fibres. The salts used were sulphates, acetates, "sulpho-acetates" (obtained by partial decomposition of a sulphate in solution by lead acetate), nitrates, chlorides, and sulphocyanates of aluminum and (ferric) iron. Starting with normal salts e. g. $R_2 \ 3 SO_4$, a series of basic salts, $R_2 \ 2 SO_4 \ (HO)_2$; $R_2 SO_4 \ (HO)_4$, etc., were obtained by action of alkaline carbonates. These definite salts, in solutions of known strength, were then submitted to the action of heat, dilution, etc., and the degree of temperature or dilution at which a precipitate appeared was noted, as well as the proportionate increase of base in such precipitate under higher temperatures, etc. Similarly, the solutions were submitted to the

action of textile fibres under varying conditions of temperature and dilution, and the proportionate deposition of oxide was determined subsequently in the ash of the fibre. The bearing of such experiments upon the operations of the dye-house will be readily seen.

The results, in general, show an increased tendency to dissociation with increase of basicity. With the degree of basicity constant, the salts of the same base with different acids, or of the same acid with different bases differ widely in their behavior under like physical conditions. (*Ding. Pol. J.* 251. 285.)   A. A. B.

On the Nitrogenous Constituents of Barley and Malt. C. LINTNER.

An investigation made to determine the relation of the proportion of nitrogen to the strength of the diastatic function in the above materials. Specimens of barley were carefully cleansed and malted, 25 grammes of the ground malt was digested for 6 hours, in each case at common temperatures, and the diastatic power of the filtered solution was determined. The malt in all cases was dried at 40°C. and the results, strictly speaking, relate only to malt made under these conditions or to green malt. Soluble nitrogen $\times 6.25$ expresses the diastase very closely. The mean proportion of diastase found in dry malt was 2 per cent. One part of diastase converts 400 of starch and the percentage of starch in a given amylaceous substance multiplied by 0.2075 gives the weight of green malt to be used. These results accord well with practice. (*Ding. Pol. J.* 251. 225).
A. A. B.

Method for the Preparation of Sodium Bicarbonate.—H. GASKELL and F. HURTER.

A patented method (D. R. P. Kl. 75.24490) in which anhydrous monocarbonate in revolving cylinders is submitted to the simultaneous action of steam and carbon dioxide. The gas and steam are mixed previously in a coke tower in such manner that CO_2 saturated with water at 82° C. shall enter the cylinder. The proportion of steam is reduced towards the close of the operation. The reaction proceeds rapidly and develops much heat; at its close dry bicarbonate ready for packing is withdrawn from the cyllinder. Dilute CO_2, as in furnace gases, may be used, the gases

then being passed through a series of cylinders to induce complete absorption. (*Ding. Pol. J.* 251. 229.) A.A.B.

On the Influence of the Ammonia Soda Process on the Value of Hydrochloric Acid and Chlorine. M. SCHEURER KESTNER.

Note relating to M. Weldon's paper on the ammonia soda process. (Soc. Ch. Ind. 1883. 434.) Leblanc's process affords both chlorine and sodium compounds, while the ammonia process affords only the sodium compounds.

The diminution in yield of HCl consequent upon the abandonment of the Leblanc process for the ammonia process has been, in part, at least, replaced by the spread of the manufacture of caustic soda, in which HCl is a by-product. The Weldon regenerative process affords only one-third of the chlorine in hydrochloric acid in the state of chlorine. It is desirable that some process should be discovered by which all the chlorine could be made available in the elementary form. (*Bul. Soc. Chim.*, XLI., 383.) E. W.

Notes on the Soda Industry. M. SCHEURER KESTNER.

M. Reidemeister has completed his researches on the sodio-calcic compound formed in crude soda liquors from the Leblanc process. Two varieties were found, viz. : $Na_2 CO_3. Ca CO_3. 5 H_2 O$, and $2 (Na_2 CO_3. Ca CO_3). 5 H_2 O$. (*Bul. Soc. Chim.*, XLI., 385.)

E. W.

On the Decomposition of Cements by Water. H. LeCHATELIER.

Hydrated cements treated with a large excess of water, give up not only the lime present as hydrate, but also in time and after treatment with fresh quantities of water, they surrender nearly all of the lime in combination. Slow-setting cements contain much calcium hydrate; quick-setting cements very little.

The following lime compounds were recognized as existing in cements; the figures at the right giving the number of grammes per litre of calcium hydrate which will prevent the decomposition of these compounds (surrender of the lime).

$Ca (HO)_2$ -------------------------------1.3   gms.

Fe_2O_3.   4 CaO, 12 H_2O---------------0.6   "

Al_2O_3. 4 CaO, 12 H_2O ----------------0.2   "

CaO. Si O_2, 3 H_2O----------------------0.05   "

(*Bul. Soc. Chim.*, XLI., 377.)   E. W.

On a Method of Obtaining Benzol from Coal-gas. J. A. KENDALL.

Coal gas passed over hot coal or coke in an iron retort yields an increase of benzol at the expense of luminosity. The best results were obtained when the gas was passed at the rate of 230 cbm. per hour through a bench of nine retorts, each three metres long and 203 mm. wide. The rate at which benzol was produced was measured in an experimental apparatus by passing a portion of the gas from the retorts through a mixture of one part strong $H NO_3$, and 5 parts conc. H_2SO_4, from which the resulting nitrobenzol was precipitated and weighed. (*Ding. Pol. J.* **251**, 83.)   A. A B.

Falsification of Tartar-emetic.

The possibility of replacing this salt in many cases in the fixation of tannin (in dyeing) by zinc sulphate or acetate, has brought into the market so-called "substitutes" for it which contain 33–59% zinc sulphate. The cost per cent. of antimony oxide in these substitutes is to that in the pure salt as 12.24 to 7.00. (*Ding. Pol. J.* **251**, 288.)   A. A. B.

Abstracts of American Patents Relating to Chemistry.

. *March* 11, 1884. •

294,752.—Composite oil for lubricating, etc.—G. W. Banker.

Brief—Improvements on Letters Patent, No. 255,096, March 21, 1882.

Claim.—The herein described composite oil, composed of castor oil and corn oil in nearly equal proportions.

294,795.—Ore roasting furnace.—N. M. Langdon.

294,796.—Gas-producing furnace.—N. M. Langdon.

294,798.—Process of an apparatus for separating raw sugar liquor from the scum and mechanical impurities contained therein.—S. M. Lillie.

A process of separating a liquid from its mechanical impurities, specifically lighter and specifically heavier than itself, consisting in subjecting the impure liquid to the action of centrifugal force in a rapidly-revolving drum, and in drawing of from the revolving drum by itself the liquid separated from its mechanical impurities by the centrifugal force.

294,840.—Lubricating compound.—B. F. Bartlett.

Graphite, dairy salt, flour of sulphur and gypsum, mixed together.

294,862.—Hydrocarbon gas generator.—J. Flannery.

294,922.—Cold-air-blast centrifugal syrup cooler.—A. B. Smith.

Consists of a cooling pipe, upon the inner surface of which the syrup is spread by means of a revolving distributer and means for forcing or conducting air through the cooling tube.

294,940.—Process of extracting oils and fats from fish.—P. C. Vogellus.

Consists in subjecting the fish to the action of plaster of Paris, or some similar water-absorbing agent, whereby the water is removed therefrom, and then mingling the fish with a suitable solvent, whereby the oil in the fish is dissolved.

294,978.—Treating volatile and inflammable oils and fluids.—S. M. Eiseman.

Brief.—Improvements on Letters Patent, No. 282,970, August 14, 1888, to same inventor.

Claim 1.—As a new article of manufacture, a hardened mass, block or cake of granulated, thickened, partly solidified, or solidified, volatile and inflammable fluid or oil.

295,113.—Substance for rendering fabrics waterproof.—L. P. Converse.

Produces a pliable water-proofing compound, unaffected by variations of temperature, by boiling linseed oil at a temperature of from 620° to 700° Fahr, and combining it with copal varnish and a pigment.

295,118.—Gas apparatus.—A. O. Granger.

295,125.—Method of pulverizing, desulphurizing and otherwise treating metaliferous ores.—F. N. Luckenbach.

Subjects them to a current of highly super-heated, dry steam or other heated vapors or gases, or currents charged with materials for which the elements of such ores have affinities.

March 18, 1884.

295,184.—Process of extracting and melting tallow at a low temperature.—H. Lisagaray and H. Leplay.

Consists in first cutting the tallow or fat fine, and shredding it, then subjecting it to a pugging process without water, and under the influence of heat to about 68°-86° Fahr, then subjecting the pugged mass to a churning operation while mixed with water and steam, at a temperature of about 136° Fahr. and finally churning and straining it, whereby the mixture of water and fat is separated from the nitrogenous substance.

295,809.—Incrustation preventive.—F. Troxel.

Claim.—A preparation or compound for extracting lime from water, and removing scale from boilers; composed of concentrated lye, rosin, and alum.

295,821.—Composition for refractory pottery.—E. F. Zinns.

Alumina, silica, magnesia, potter's clay, and graphite.

295,842.—Concentration and evaporation of sirups.—A. P. Boon.

Consists in pumping or injecting heated air at high pressure, and in an extremely fine state of division into the same.

295,508.—Vat or kettle for reducing or treating animal or vegetable matter —T. Swanton.

Vat has a perforated bottom plate, a perforated partition having an open space between its walls, and perforated ends set to leave spaces between these ends and the ends of the vat case.

March 25th, 1884.

295,525.—Compound for waterproofing and preserving buildings.—B. de Nise.

Fossil wax, carnauba wax, refined paraffine oil, and carbolic acid, united by heat.

295,550.—Process of, and apparatus for, vaporizing hydrocarbon oils.—H. F. Hayden.

295,576.—Chemical car warmer.—C. Mitchell.

Not intelligible without the specification.

295,615.—Process of treating fibrous rubber waste for the recovery of the rubber or caoutchouc therefrom.—A. O. Bourn.

Improvement on the invention in Letters Patent No. 292891, February 5th, 1884.

Destroys the cotton fiber contained in such waste by subjecting it the action of nitric or muriatic acid, or both acids of sufficient strength.

295,633.—Removing oleine from linseed oil.—T. H. Gray.

Consists in maintaining the oil at a temp. of 110° Fahr., and in a state of agitation for about ten hours a day for nine to fourteen days ; then mixing therewith, while hot and in a state of agitation, a saline solution, and finally drawing off the saline and oleine precipitate, and washing the purified oil with pure water until no further precipitate is obtained.

295,646.—Reverberatory ore furnace.—G. W. Jones.

For desulphurizing, chloridizing, and chlorinating. Not intelligible without the drawing.

295,653.—Coloring and bronzing leather.—L. Klopfer.

A number of recipes for preparing the leather before applying the coloring matter or metal.

295,815 and 295,816.—Process of extracting metals from ores or metallurgical products.—E. H. Russell.

Consists in subjecting the ore or product to the dissolving action of a hyposulphite solution, and then to the dissolving action of a solution containing the double salt of cupreous hyposulphite and sodium hyposulphite.

295,822.—Apparatus for manufacturing illuminating gas.—J. J. Shedlock.

Brief.—Coal is distilled, as usual, in heated retorts and the gas conducted to the hydraulic main. The tar condensed from such gas while passing through a condenser, is passed into the top of a vertical retort containing solid carbon, while superheated steam is supplied to the bottom of such retort and decomposed into hydrogen and carbonic oxide in contact with the heated carbon, and the hydrogen combines with the rich gas and vapor from the tar to form carbureted hydrogen. These gases are passed into the main and mixed with the coal gas. Steam is superheated by passage through a coil of refractory material located in the retort furnace.

295,825.—Manufacture of parachinanisol.—Z. H. Skraup.

Not intelligible without the specification.

295,832.—Process of, and apparatus for, manufacturing gas.—J. L. Stewart.

295,841.—Manufacture of sugar.—K. Trobach.

Process of first freeing the saccharine substances of their water by means of alcohol vapor, and then extracting the sugar from such substances by means of rectified alcohol.

295,865.—Manufacture of paper pulp.—D. O. Francke.

Method of manufacturing paper pulp at a single operation by subjecting wood or analogous vegetable matter in a divided state to gentle mechanical

295,118.—Gas apparatus.—A. O. Granger.

295,125.—Method of pulverizing, desulphurizing and otherwise treating metaliferous ores.—F. N. Luckenbach.

Subjects them to a current of highly super-heated, dry steam or other heated vapors or gases, or currents charged with materials for which the elements of such ores have affinities.

March 18, 1884.

295,184.—Process of extracting and melting tallow at a low temperature.— H. Lisagaray and H. Leplay.

Consists in first cutting the tallow or fat fine, and shredding it, then subjecting it to a pugging process without water, and under the influence of heat to about 68°-86° Fahr, then subjecting the pugged mass to a churning operation while mixed with water and steam, at a temperature of about 136° Fahr. and finally churning and straining it, whereby the mixture of water and fat is separated from the nitrogenous substance.

295,309.—Incrustation preventive.—F. Troxel.

Claim.—A preparation or compound for extracting lime from water, and removing scale from boilers ; composed of concentrated lye, rosin, and alum.

295,321.—Composition for refractory pottery.—E. F. Zinns.

Alumina, silica, magnesia, potter's clay, and graphite.

295,342.—Concentration and evaporation of sirups.—A. P. Boon.

Consists in pumping or injecting heated air at high pressure, and in an extremely fine state of division into the same.

295,508.—Vat or kettle for reducing or treating animal or vegetable matter —T. Swanton.

Vat has a perforated bottom plate, a perforated partition having an open space between its walls, and perforated ends set to leave spaces between these ends and the ends of the vat case.

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Consists in subjecting the ore or product to the dissolving action of a hyposulphite solution, and then to the dissolving action of a solution containing the double salt of cupreous hyposulphite and sodium hyposulphite.

295,822.—Apparatus for manufacturing illuminating gas.—J. J. Shedlock.

Brief.—Coal is distilled, as usual, in heated retorts and the gas conducted to the hydraulic main. The tar condensed from such gas while passing through a condenser, is passed into the top of a vertical retort containing solid carbon, while superheated steam is supplied to the bottom of such retort and decomposed into hydrogen and carbonic oxide in contact with the heated carbon, and the hydrogen combines with the rich gas and vapor from the tar to form carbureted hydrogen. These gases are passed into the main and mixed with the coal gas. Steam is superheated by passage through a coil of refractory material located in the retort furnace.

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295,841.—Manufacture of sugar.—K. Trobach.

Process of first freeing the saccharine substances of their water by means of alcohol vapor, and then extracting the sugar from such substances by means of rectified alcohol.

295,865.—Manufacture of paper pulp.—D. O. Francke.

Method of manufacturing paper pulp at a single operation by subjecting wood or analogous vegetable matter in a divided state to gentle mechanical

agitation with acid sulphite at a temperature of about 300° Fahr. and a strength of 4° or 5° Beaumé.

295,876.—Antiseptic solution.—J. F. Kennedy.
Consists of water, alum, granulated sugar, saltpeter, and gum arabic.

295,881.—Waterproofing composition.—A. Mink.
Tallow, rosin, creosote, rape seed and ammonia.

295,882.—Composition for cleaning textile fabrics, wooden and metallic surfaces.—F. S. Monroe.
Water, aqua ammonia, white castile soap, borax and nitrate of potash.

295,886.—Process of purifying hyphosulphite solutions used in leaching ores.—E.H. Russell.
The process of restoring the solutions after they have been used, consisting in introducing into the solutions sulphuric acid to neutralize the impurities therein.

295,887.—Process of separating metals from ores and metallurgical products.—E. H. Russell.
The process of removing precious metals and lead from their ores or metallurgical products and separating them from each other, consisting in dissolving them both out of the ore or product with a hyposulphite solution, and then adding to the resulting solution a soluble carbonate to precipitate the lead.

295,890.—Purifying water.—W. Tweedale.
Adds a saturated solution of lime water to the water to be treated and which has previously been highly heated. It is then thouroughly agitated and allowed more or less time to settle whereupon carbonate of soda is added, and the heated mixture again agitated and allowed to settle.

O. H. K.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Regular Meeting, Friday June 6th, 1884.

The minutes of the May meeting were read and approved. The minutes of the meeting of the Board of Directors, held May 29th were read. The following new members were elected :

Richard Linke, 345 East 18th street, New York City, proposed by James H. Stebbins, Jr., Wm. Rupp, A. R. Leeds.

Arthur S. Greene, Ann Arbor, Michigan, proposed by A. R. Prescott, P. Casamajor, H. Endemann.

Dr. H. M. Baker, 87 Ross street, Brooklyn, N. Y., proposed by P. Casamann, H. Endemann, N. Alsberg.

As an associate member, Charles A. Heinitsh, Lancaster, Pa., proposed by A. A. Breneman, A. R. Leeds, W. Rupp.

Professor A. W. Hofmann, of Berlin, Prussia, and M. M. E. Chevreul, of Paris, were elected honorary members.

The following papers were then read :

Note on the Examination of Snow Water, by Elwyn Waller.

Discussion by the Chair and others.

On Method for the Assay of Indigo, by Charles Tennant Lee.

Discussion by Mr. Rau, who objected to this method, because indirubine sublimes at a lower temperature than indigotine.

On an Analysis of Slag from Ignited Garbage, by C. E. Munsell.

Discussion by Messrs. Breneman, Casamajor, Endemann and the Chair.

The subject of commercial testing of soda and acetic acid was introduced.

After some discussion it was moved—

"That a committee of five be appointed by the Chair to consider the subject of unform commercial tests for soda and acetic acid, and report to the Society at the September meeting ; said committee to have power to fill vacancies." Carried.

Messrs. Habirshaw, Breneman, Alsberg, Leeds and Endemann were appointed on this committee.

The meeting then adjourned until Friday, September 19th, 1884.

<div style="text-align:center">C. E. MUNSELL,</div>

<div style="text-align:right">Recording Secretary.</div>

ADDITIONS TO. THE LIBRARY,

DURING MAY, 1884.

From the Department of Agriculture, Washington, D. C. :
  " Report for 1883."

From the Bureau of Statistics, Washington, D. C. :
  " Internal Commerce of the United States, 1882."

From the American Institute of Mining Engineers :

  C. A. Stetefeldt.: " Russel's Improved Process for the Lixiviation of Silver Ores" (pamphlet).

  A. V. Abbott, C. E.: " Improvements in Methods for Physical Tests" (pamphlet).

  T. Egleston, Ph. D.: " Some Researches on the Amalgamation of Gold and Silver" (pamphlet).

  S. Stutz, M. E.: " Improvements in Coal Washing, Elevating and Conveying Machinery" (pamphlet).

A GENERAL METHOD OF TOUGHENING GOLD (AND SILVER) IN THE MELTING CRUCIBLE.

By DR. JAMES C. BOOTH, OF THE U. S. MINT, PHILADELPHIA.

Gold and silver differ from other elements, except those of the platinum group in their feeble affinity for oxygen, and by means of this property, we can separate the noble metals from others by fusion in the fire, in which heat removes oxygen from gold and silver and attaches it to the others. To this first class we may add a second, embracing iron, nickel, copper, tin, bismuth, and lead, whose oxides may be reduced to metal by being heated with fuel, or without reduction can be melted with fluxes or slag. A third class, arsenic, antimony and sulphur, are reduced and volatilized, or are fluxed off with alkali and oxides of the second class.

To illustrate the subject practically, I shall describe an operation of toughening brittle gold, which I recently performed at the United States Mint at Philadelphia. Some brittle gold, having been accidently melted with a quantity of well refined and tough gold, was found to have rendered the whole mass very brittle, with a highly crystalline fracture, and therefore useless for coinage. I determined to avoid loss of time, and the greater cost of refining by acid, and to toughen it wholly by fluxing. This was accomplished on $75,162\frac{55}{100}$ ounces ($= 5,154$ lbs. av.) in $1\frac{1}{2}$ days, at a trifling cost, and with scarcely apparent loss. The 75,000 oz. were divided into 14 melts of about 5,400 oz. each, and each melt separately toughened. The ingots, easily broken into pieces by striking them on the edge of a wooden box, were put into the crucible with soda ash and anhydrous, fused borax, in the ratio of one or two ounces to a melt, until the crucible was nearly full. It then appeared as a quiet mass of metal covered with a rather viscid slag, disposed to swell and puff. A few crystals of saltpetre, say one or two ounces, were then dropped successively into the centre of the metallic surface, and as they melted, their spreading out over the whole surface was aided by the concentric motion of the bottom of a small crucible. The moment the visible oxidizing action began to slacken, the melter skimmed off, by a small, black-lead dipping crucible, the fluxed matter as rapidly as was consistent with the care necessary to avoid taking up metal. The remainder in the melting pot was the toughened metal.

There are several points worth noting in the operations just de-
cribed.   1. One part of the foreign matter was sufficient to impart
brittleness to 75,000 parts of good standard gold (st. gold = 900
gold + 100 copper, &c.).   2. By a slight oxidizing process the
matter causing brittleness was collected and removed at a trifling
cost in 1½ days, without appreciable loss of gold.   3. Still more
remarkable is the fact that the 14 melts of gold, in their brittle state,
proved by assay to be of true standard, 900 gold + 100 alloy (usually
90 copper + 10 silver), after their brittleness had been changed to
toughness by fluxing and skimming, were still 900 gold + 100
alloy, inappreciably altered.   So delicately executed is the act of
toughening, that although 10 per cent. of the metal is easily ox-
idized copper, yet the ratio of copper after fluxing is the same.   4.
Another point worthy of remark is that the toughening proceeds
from the top downward, to the depth of 9 to 12 inches of its own
accord, although it is stirred towards the close of the operation
to render the melt uniform throughout.

I do not wish the inference to be drawn that every case of
toughening brittle gold is as successful or simple as the above.
When the metal contains a larger proportion of foreign matter,
the operation of fluxing, nitring and skimming may have to be re-
peated, perhaps more than once.   While the crucible is on the fire,
the perfection of the toughening may be readily ascertained in 2 or
3 minutes by casting a thin strp, ¼ — ⅜ inch thick, and doubling
it under the hammer or rolling it, the cracking of the strip in this
case, if any, or its snapping asunder, informing the experienced
eye of the degree of completeness in the toughening operation.

When the bullion appears to be baser—to contain a larger amount
of foreign matter than in the example specially quoted in this
paper, and experience can often make an approximate guess at the
degree of baseness as well as at the nature of the elements causing
it, then the only change made in the toughening consists in
using a larger amount of soda and borax, and a still larger propor-
tion of nitre.   Two points are to be noted in the use of a large
amount of this more oxidizing flux: 1. That some of the graphite
of the crucible at the level of the liquid is cut away, injuring the
cruucible and weakening the oxidizing power of the nitre.   2. That
since the larger bulk of fluxing matter increases, the time of skim-
ming, some of the oxidized foreign matter, in the presence of a

large amount of metal, and surrounded by graphite, tends to revert
to the metallic state.

To obviate these difficulties or objectionable features, after going
through the stronger oxidizing process, as above described, the ox-
idation is suddenly fixed by the rapid addition to the floating slag
of sand lime or bone ash, which is stirred with the slag and
thickens or stiffens it, so as to allow more deliberate skimming of
the whole mass without fear of reoxidization. I have tried the
three thickeners above named, which seem to act rather mechani-
cally than chemically, and, of the three, prefer sand. Where thick-
eners are employed on standard gold, there is greater liability to an
increase in fineness of the standard by the removal of oxide of
copper, together with the oxidized embrittler, so that brittle gold .
of 900 after toughening may be 900.5 or even 901.

The toughening of the above 75,000 oz. effected in 14 meltings (14
crucibles full) of over 5,000 oz. each in standard gold, resulted in
less than a crucible full of skimmings. The skimmings are worked
down to metal and poor slag as follows. They are quietly melted
and cooled slowly, so as to form a *king* of metal at the bottom of
the crucible, and a glassy or cindery slag above. The last is ground
and separated by sifting and washing into metallic grains and poor
cinder. The grain and king are again fluxed and treated as before,
either by themselves, or as usual with other light residues. Thus,
the impurities of gold (and silver) are successively worked out, by
concentrating them in a small bulk and weight of metal, and puri-
fying it with a greater diminished risk of loss of gold than if we
attempted to purify a large mass at one operation. In the case
detailed in this paper, the impurities were concentrated by a single
operation of purifying in a king of about (8) eight oz. From the
purification of this king, we have ground for asserting that the
impurity causing brittleness in the whole 75,000 oz. was a small
fraction of an ounce, probably $\frac{1}{300,000}$ or less, of the original weight.

As a concluding note to this paper, I must state that a great deal
of skill is required to avoid loss of gold in executing the process
herein detailed; that the melter must have unusual powers of ob-
servation and long practice to acquire the necessary skill, and
I deem it but justice to state that Mr. F. C. Garrigues, my fore-
man, especially in the melting department of the Mint, possessess
the requisite skill and practice, and that he performed the opera-
tions above described.

METHOD FOR THE ASSAY OF INDIGO.
By Charles Tennant Lee.

The determination of indigo blue, or indigotin, in indigo, presents various difficulties. The processes in use are long, and subject to considerable error. The methods which depend upon the reduction and subsequent measured oxidation of indigo, require the elimination, previously, of all other reducible bodies, to insure accuracy—an operation both long and tedious. The method by formation of sulpindigotine and its estimation by a standardized permanganate solution, always gives too high results by reason of the presence of other oxidisable bodies.

For several years the author has used a method by sublimation, which has been uniformly satisfactory. Indigo blue sublimes readily and, by a careful regulation of temperature, can be separated from the other components of indigo, indigo brown, indigo red, mucilaginous matter, etc.

The operation is best effected in a shallow platinum tray. Those in use are 7 cm. long, 2 cm. wide, 3-4 mm. deep. Into such a tray is weighed about 0.25 grms. of finely powdered indigo which has been dried at 100° C. The weighing should be rapid to avoid absorption of moisture, and it is best not to exceed this amount greatly for a tray of the size noted, in order that the layer of indigo may be thin.

Spread the weighed powder evenly over the tray by tapping it with the finger; this can be done easily if the bottom of the tray is quite flat, with no rounding towards the sides. Sublime on an iron plate, at first raising the heat gradually to avoid burning.

When the surface of the indigo is covered over with a shining layer of crystals, turn down upon the plate a piece of Russia iron bent into the form of a flat arch, the highest point of which is about 1 cm. above the plate, and a little longer than the tray. Lower the heat at the same time that the arch is put on, as the temperature rises rapidly.

The purple vapors of indigotin are now given off, a portion condensing upon the under sides of the arch. Raise the heat slowly, and enough to maintain a constant sublimation of indigotin. By raising the arch the progress of the work is seen. For a 50% indigo the time required is 30–40 minutes; but soft, Java indigo must be sublimed with more caution, and sometimes require

two hours. The last crystals of indigotin are easily seen upon the the dark colored surface of the residue. When all have disappeared, remove the tray, cool in a dessicator, and weigh. The loss in weight is indigotin. Observe that the heat be no greater than is required to sublime the indigo blue ; and that no yellowish vapors appear, which would indicate the destruction of the residue, leaving only ash.

If the bottom of the tray is flat and everywhere touches the plate, the sublimation goes on regularly, except in case of very rich indigos, already mentioned, when care must be exercised to prevent burning.

Results by this method are constant within ¼ of 1 per cent.,' but the author has frequently made re-determinations with variations of only half that error.

A little practice enables one to leave the sublimation with only occasional attention, and three or four determinations may be carried on at once under the same arched cover.

For commercial and industrial purposes this method appears to have decided advantages. Its rapidity is in great contrast to the other methods which admit of perhaps two determinations in a day, while in point of accuracy it is not wanting.

Laboratory 45 Kilby st.,
  Boston, 5th May, 1884.

NOTE ON EXAMINATION OF SNOW WATER.

By E. Waller, Ph. D.

During the first snow-storm of the past winter (December 19th, 1083) some of the fresh fallen snow was collected and submitted to examination. As the results may be of some interest to the members of the Society I beg to submit them.

The sample was collected in the yard at Columbia College after it had been snowing for some three or four hours, and snow was still falling. The ground was then covered to the depth of about four inches.

The snow was taken up without touching it with the hands, and placed in a large stoppered bottle, which was then closed and placed on the shelf in the laboratory until the snow had melted. It may be here noted that the surface beneath the spot from which it was taken was a graveled walk. The examination of the water was conducted after the larger particles of sand, coal from the engines on 4th ave. &c. had settled out. The water was slightly turbid. The results were (in parts per 100,000.)

Chlorine	trace	Free Ammonia	0.0396
Phosphates	none	Albuminoid Ammonia	0.0318
Nitrates	none	Hardness	0.91
Nitrogen in Nitrates	0.0494	Total Solids	6.3

The sediment from the water was collected. While it was settling a slimy fungoid growth collected at the bottom of the vessel which caused the sediment to adhere somewhat to the glass. To remove this the material was gently ignited and afterward examined under the microscope. The object aimed at was the identification if possible, of particles supposed to have come from the Java volcano, Krakatoa, which have been asserted to exist in the snow, &c., which fell in the early part of the winter. A specimen of the volcanic ash known to have come from that volcano was also examined under the microscope at the same time. A ¼ objective (Beck) was used. To my eye the only forms common to both the specimens were small, vitreous particles looking like broken up microscope covers.

I am, however, not familiar with the characters of volcanic ashes under the microscope, and may have missed what should be looked upon as characteristic. Judging from what was observed, it seems doubtful whether it could be safely asserted that the snow contained any particles which originally came from the volcano.

AN ANALYSIS OF SLAG FROM IGNITED GARBAGE.

By Charles E. Munsell, Ph. D.

The sample analyzed was prepared, under the direction of Dr. C. F. Chandler, by roasting and then igniting street sweepings and garbage, until all carbonaceous matter had disappeared. The analysis was made according to the methods of the late F. A. Cairns.

The results were as follows:

Silica	60.65
Alumina	12.88
Ferrous Oxide	3.13
Lime	14.21
Magnesia	1.93
Sulphuric Acid (SO_3)	1.24
Phosphoric Acid (P_2O_5)	.77
Potassa	1.79
Soda	2.36
Carbon Dioxide and loss	1.04
	100.00

The large percentage of silica is due to the wear of the street pavements and the alumina and lime to coal ashes; probably some of the alkalies were volatilized.

The analysis, as a whole, shows that the product could not be economically utilized as a fertilizer, as steam-packing, or for making cement.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

On the Sulphides of Phosphorus. E. DERVIN.

A mixture of sulphur with P_2S_3 dissolved in carbon disulphide, when exposed to light, afforded PS_4 or the P_3S_{12} of Rame. The same mixture heated in sealed tubes to 180°, yielded $P_4S_{11} = P_2S_3$, 2 PS_4. The effect of heat upon mixtures of P_2S_3 with PS_3 or PS_5, afforded PS_4, or, when the P_2S_3 was in great excess, P_4S_{11}. Attempts to prepare PS_3 by fusion were unsuccessful, and the author expressed doubts as to its existence as a definite compound. (*Bul. Soc. Chim.*, **41**, 433.)   E. W.

On the Sulphites and Bisulphites of Soda. R. DE FORCRAND.

The results of thermo-chemical investigations on the pure crystalized sulphite (with 7aq.), and bisulphite or metasulphite $Na_2S_2O_5$ (anhydrous). (*Bul. Soc. Chim.*, **41**, 436.)   E. W.

On Glyoxal Bisulphite of Soda. R. DE FORCRAND.

Thermochemical examination of the compound which contains two molecules of the bisulphite to one of glyoxal. (*Bul. Soc. Chim.*, **41**, 441.)   E. W.

The Heat of Hydration of Salts.—S. U. PICKERING.

The heat of hydration of an anhydrous salt has been taken heretofore as the difference between the heat of solution of the anhydrous salt and that of the hydrated salt. This difference includes both the heat of combination of the anhydrous salt with water and the heat set free on solidification of this water, since Persoz has shown that the water in hydrated salts is in the solid state. (*Chem. News*, **49**, 216.)

A. A. B.

Note on the non-existence of Ammonium Hydrate. D. TOMMASI.

NH_4 OH, if it exists, must be very unstable.

The calculation of the heat of combination of the hydrate does not correspond with the amount found by actual experiment, as is the case with other alkaline and alkaline earth hydrates. The author consequently concludes that it does not exist. (*Bul. Soc. Chim.*, **41**, 444.)   E. W.

On the quantities of heat disengaged by the compression of solid bodies. W. SPRING.

A criticism of the remark of M. Jannettaz, that the compression of solids generates considerable heat, and consequently that the formation of chemical compounds by pressure, is attributed rather to the heat developed than to the pressure itself. The author describes several experiments to show that this proposition is untenable. (*Bul. Soc. Chim.*, **41**, 488.)   K. W.

On the quantities of Sulphides found by successive compressions of their elements. W. SPRING.

The results of successive compressions of mixtures of sulphur with silver, lead and copper are here given. The conclusion is that pressure determines the combination of solid substances with one another under certain conditions, the quantity of compound produced depends both on the size of the surfaces in contact and the duration of this contact. (*Bul. Soc. Chim.*, **41**, p. 492.)   E. W.

ORGANIC CHEMISTRY.

On the probable number of homologous and isomeric Rosanilines. MM. ROSENSTEIHL AND GERBER.

The authors refer to the researches of Hofmann, E. and O. Fischer, Coupier, and to their own, which indicate that in the preparation of rosanilines, paratoluidene may be replaced by different homologues, and the aniline by certain amido-methylbenzenes. A discussion of the necessary constitution of the compounds from which the rosanilines can be prepared is given. (*Bul. Soc. Chim.*, **41**, 418.)   E. W.

On the Synthesis of the diphenyl Ethane derived from Elhylidene Chloride. R. D. SILVA.

A claim of priority as against MM. Angelbis and Anchütz (Berichte, 1884, 165). The author notes that ethylbenzene has never been found by him in preparing symmetrical dibenzyl or diphenyl ethane, but in preparing dissymmetrical diphenyl propanes, considerable quantities of a cumene, C_3H_7,C_6H_5 were obtained. (*Bul. Soc. Chim.*, **41**, 448.)   E. W.

Action of Isobutylchloride on Benzene in presence of Aluminium Chloride. E. GOSSIN.

The reaction in the cold afforded butyl benzene, $C_{10}N_{14}(=C_4H_9$ $—C_6H_5)$ boiling at 166–167°; vapor density 4.72 (Meyers' method); specific. gravity 0.8795. A small amount of a liquid boiling at 152–155°, and having the same percentage composition $(C_{10}H_{14})$ was also formed. (*Bul. Soc. Chim.*, **41**, 446.)   E. W.

On Anthemene—Researches on Roman Chamomile. L. NAUDIN.

After extracting chamomile flowers completely with petroleum ether (by the use of cold and vacuum), about nine-tenths of the solvent were distilled off. The residue, by long standing, deposited a crop of crystals which, when examined with the microscope, were found to consist of two different compounds. By dissolving them in twenty times their weight of boiling alcohol, filtering boiling hot, and allowing to cool, but one of the compounds separated in fine needles. By concentrating the solution, crystals of the second body were obtained. The substances were purified by

fractional crystalization ; the one least soluble in alcohol fused at 63–64°, the other at 188–189°. The first was more especially examined. It is white, without taste or odor, boils at 440° without apparent decomposition. Density at 15°, 0.942. Insoluble in water, soluble in ether, petroleum, etc. Fairly soluble in boiling absolute alcohol, very slightly so in cold. The elementary analysis presented a curious anomaly, essentially confirmed by a check analysis made at the author's request by M. Schutzenberger.

	Narodin (mean of several).	Schutzenberger.
C	83.80	84.30
H	14.40	14.17
Loss	1.80	1.53

No oxygen appeared to be present. Vapor density referred to hydrogen, observed 127 ; theory for $C_{18}H_{36}$, 131. The author proposes to call it β–octadecene, or anthémène, the analysis, excluding the incomprehensible loss, indicating the above formula. (*Bul. Soc. Chem.*, **41,** 483.)   E. W.

ANALYTICAL CHEMISTRY.

On the Determination of Phosphorus in Iron and Iron Ores.—A. ZAMM.

Dissolve the iron in $H NO_3$ (1.20) using 12c.c. per grm. of iron, boil briskly to dryness and heat for 1 hour at 200° C. Then add 6c.c. of HCl (1.12) per grm. of iron, boil to dryness, add HCl, boil again to near dryness, and finally, add 1–2 volumes of water and filter off silica. Strong heating after action of HNO_3 ensures complete precipitation by molybdate.

Add an equal volume of the molybdate, prepared according to Eggertz' directions, to the solution of iron, which should not exceed 20c.c. per grm. of iron. If the proportion of phosphorus is up to several tenths of one per cent. add [an excess of molybdate, equal to 2c.c. for each .001 grm. of P. Heat for 1 hour at 40°, remove the liquid with a syphon having a lateral opening near the closed end of the shorter limb (to prevent disturbance of the precipitate) wash on a very small filter with 1 % solution of $H NO_3$ (1.20) dry and weigh. The yellow precipitate contains 1.64% of P. The filter should have been previously dried at 120° and weighed or when great accuracy is not desired, 5 per cent. of the weight of the undried filter may be deducted for moisture. In absence of arsenic the precipitation may be completed in 1 hour at 50°. (*Chem. News*, **49**, 208.)

<div align="right">A. A. B.</div>

New method of determining Carbon in Cast Iron. M. ZABOUDSKY.

The finely pulverized metal is mixed with a dry mixture of copper and sodium chlorides (prepared by evaporating to dryness a solution of copper sulphate with sodium chloride). About 14 grams. of the mixture, containing 4.8 grams. $CuCl_2$, is taken for each gramme of iron. After thorough mixing (dry) in a mortar, water sufficient to form a paste is added, and the mass is triturated for about half an hour. The mass is then transferred to a beaker, the mortar rinsed into the beaker with ferric chloride solution (1 to 4), and 200 c.c. of the latter added. After gentle heating, hydrochloric acid is added. If properly managed at this point, only the carbonaceous material should remain undissolved; this should be filtered through asbestos, dried at 125° to 130°

and weighed. The residue is not pure carbon, as has been usually supposed, but contains hydrogen and oxygen in combination with it. The amount obtained must be multiplied by one of the following factors to obtain the actual amount of carbon present :

	Factor.
From Spiegel, not manganiferous	0.720
Ferromanganese	0,700
Spiegel, manganiferous	0.685
White pig	} 0.710
Pure gray pig	
Very pure gray pig with a little combined C	0.655
Cast steel of guns and muskets containing about 0.5% C.	0.660
Hard steel	0.675
Iron	0.690

The author finds the results more satisfactory than by the Eggertz iodine method. (*Bul. Soc. Chim.*, **41**, 428.) E. W.

The estimation of Sulphurous Acid in its compounds. W. B. Giles and A. Shearer.

The authors incidentally note that crystallized sodium sulphite invariably contains $7H_2O$, the $10 H_2O$ crystals having never been noticed by them. Fresenius' method of analysis, with iodine solution, was found to give results which were constant but invariably low. The difficulty in obtaining and keeping water free from dissolved air, also proved to be a strong objection to the process. The method which they propose consists in pouring upon the material (after weighing out), at once, *without dissolving*, an excess of $\frac{1}{10}$ normal iodine solution, effecting solution in this, and titrating back with thiosulphate and starch. In the case of fluids they may be sealed up in thin glass bulbs, which may be broken under the iodine solution. After a preliminary approximate test, a second is made, using only a slight excess of the $n/\frac{1}{10}$ I solution. Attention is called to the siphons of liquid SO_2, furnished for laboratory use by a manufacturer in England. (*Jour. Soc. Chem. Ind.*, **3**, 197).

E. W.

Determination of Phosphoric Acid in Arable Soils.—By G. Lechatier.

In two communications presented by M. de Gasparin, one in

1883, and another in January, 1884, (this journal, vol. VI., p. 137), the following process is given for the determination of phosphoric acid in arable soils.

The specimen of soil is treated by *aqua regia*, and the soluble portion obtained is precipitated by ammonia. The precipitate is collected, dried, strongly heated, pulverized and treated with cold nitric acid of $\frac{1}{10}$ strength. Phosphoric acid is dissolved and ferric oxide remains. The former is precipitated with ammonium molybdate.

The author has had to determine phosphoric acid in soils. The solutions of which in *aqua regia* contain variable quantities of lime, magnesia, potassa, soda ferric oxide, alumina, phosphoric acid and silica. Generally the quantities of lime and magnesia are very small. In these solutions, the successive addition of small quantities of ammonia, separate phosphoric acid as ferric and aluminic phosphates, while the liquid is still acid, and before calcic phosphate separates. The ferric and aluminic phosphates are not entirely soluble in nitric acid of $\frac{1}{10}$ strength.

The following experiments were made with acid solutions containing .041 grm. of phosphoric acid and varying proportions of ferric oxide.

Ferric oxide, mixed with .041 grm. phosphoric acid.	Phosphoric acid dissolved in weak nitric acid.
grm.	grm.
0.8	0.038
2.0	0.023
4.0	0.021

If the quantity of phosphoric acid is doubled, the quantity dissolved is only $\frac{1}{2}$ to $\frac{3}{4}$ of the quantity present. Nitric acid of $\frac{1}{10}$ strength was used. The remainder of the phosphoric acid was found in the calcined precipitate, showing that precipitation was complete, but solution defective. Similar results were obtained with alumina.

The author precipitates ferric oxide and phosphoric acid with milk of pure lime, so to have an excess of lime in the precipiate. This precipitate was strongly heated, reduced to a fine powder and digested at 60° C. in nitric acid (acid 2 c.c., water 200 c.c.) Phosphoric acid is then entirely dissolved, even when mixed with 80 times its weight of ferric oxide. If digestion

takes place in the cold, with an acid solution of $\frac{1}{40}$, only 0.036 grm. is dissolved out of 0.041 grm. of phosphoric acid.

A certain quantity of ferric oxide is dissolved, but phosphoric acid may be separated by molybdic acid even in presence of a large quantity of ferric oxide.—(*Comptes Rend.* **98**, 817.)

<div align="right">P. C.</div>

On the Examination of Tanning Extracts. F. SIMAND.

The author prefers the improved Löwenthal Method (D. Pol. J. **246**, 41, 133) for technical determinations, but calls attention to the fact that hot water dissolves more tannin from these extracts than cold water, and insists on the necessity of specifying whether hot or cold water has been used, when results of an analysis are given. The results obtained with hot and cold water extracts of quebracho, oak, beech and chestnut wood, and with valonea, oak bark and sumac respectively, exhibit differences varying from 2.45 in oak wood, to 19.66 in sumac, per 100 of tannin. (*D. Pol. J.*, **251**, 472.)

<div align="right">A. A. B.</div>

INDUSTRIAL CHEMISTRY.

On the Oxidation of Cellulose with special reference to the chemistry of Bleaching and Dyeing. C. F. CROSS and E. J. BEVAN.

A review of results obtained by the author as well as by G. Witz (Bull. Soc. Ind. Rouen[10] 5, 416 and [11] 2, 169), (Drug. Pol. Journ., 250, 271), regarding the oxidation products of cellulose. Witz found that solution of bleaching powder and CO_2 had no apparent action upon cotton goods below 60°, but above that temperature the action was marked, the effects increasing with the temperature, until at 100° the cotton was resolved into a powder. Light assisted the action. The compound formed, which he called oxycellulose, contained about 1 per cent. more oxygen than cellulose. This compound has a strong affinity for certain coloring matters, principally those of a basic character. Methylamine blue dyes it readily, and was used as a test for its presence. For diphenylamine blue it has no affinity. The tests are best made in a 1,2000 cold solution of the former, in which the cotton is soaked for 20 minutes. If the cloth has been bleached the chlorine must be removed by a series of washings with diluted reagents, nitric acid, bisulphite of soda, hydrochloric acid, &c., the mode of using which is specified. The researches of M. Witz furnish a guide to bleachers to the best method of managing their goods so as to bleach, and at the same time avoid injuring the fibre. The oxycellulose, which can be produced at will, has a strong affinity for vanadium compounds, so great indeed that it will abstract the vanadium from a solution containing a million millionth part (1,000,000,000,000).

Patterns in oxycellulose can be made on the cloth, i. e., the oxycellulose can be used as a mordant for many dyes. Caustic alkalies prevent the formation of this compound. Many hitherto unexplained phenomena in bleaching and dyeing have been made clear by the discovery of this compound. The jute cellulose, isolated and examined by the authors, seems to be identical with oxycellulose. Another oxydation product of cellulose recently obtained by use of an alkaline solution of potassium permanganate, is also briefly mentioned. It seems to be $C_{19} H_{18} O_{22}$, and closely resembles Fremy's metapectic acid. (*Jour. Soc. Chem. Ind.*, 3, 206).

<div align="right">E. W.</div>

Injury done to vegetation by Gases arising from certain manufacturing processes. S. HAMBURGER.

A table of the results of a series of examinations of leaves from different plants, most of which grew in the neighborhood of manufactories at St. Helens. From the amounts of ash of SO_3 and of Cl determined, no positive inferences could be drawn. Testing the aqueous extract of the plant with litmus paper, appeared also to be of no service. The SO_2 in gases from the combustion of coal, appeared really to be the principal cause of injury to vegetation. Angus Smith found in the air of London 730 grains SO_3 per million cubic feet and 1098 grains in that of Manchester. The author found 1260 grains in the air of St. Helens. Assuming a coal of average composition, containing 2 per cent. S, he calculates that fire gases contain 0.193 volume per cent. SO_3, and would have to be diluted with 64 times their volume to bring the proportion down to 0.003 volume per cent., the limit of safety according to Freytag. Fruit trees are most sensitive to these gases, forest trees are less so, and agricultural plants are still less. Soot is not damaging to plants.

Experiments were made by treating plants with the spray of dilute acids. Two thousandth normal solutions of H_2SO_4 and HCl. (0.0245 gm. H_2SO_4 or 0.01825 gm. HCl per litre), the strongest solutions tried, seemed to be without effect. Experiment showd that chlorophyll, under the influence of acids, sooner or later turned brown, depositing a brownish sediment. Leaves damaged by acid fumes showed brownish spots, but attacks of insects, fungi, &c., sometimes caused similar spots. (*Jour. Soc. Chem. Ind.*, 3, 202.) E. W.

Further notes upon the solidification of Fatty Oils. W. L. CARPENTER.

Description of the process of St. Cyr Radisson for the conversion of oleic acid into palmitic by means of the reaction observed by Varentrapp in 1841. It consists in heating the oleic acid with a large excess of caustic potash, the reaction being

$$C_{18}H_{34}O_2 + 2KHO = C_{16}H_{31}KO_3 + C_2H_3KO_2 + H_2.$$
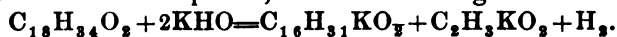
The apparatus (termed a "cartouch") consists of a short, closed cylinder, with funnel-shaped base and provided with mechanical stirrer. A sectional view is given. It is charged with 1,500 kil.

oleic acid and 2,500 kil. potash lye (Sp. Gr. 1.4). Heat is applied, a hole in the cover being left open until steam ceases to escape, when it is closed, and the gases escaping are passed through a coke tower to a gas holder. The reaction begins at 290° C., and goes on at 300 to 310°. At 320° the odor of the gas changes, and steam must be at once injected to prevent destructive distillation. 36 to 40 hours are required to complete a charge. The progress of the reaction is judged of by the congealing point (Dalicau test) of the fatty acids obtained from small samples withdrawn from time to time. (*Jour. Soc. Chem. Ind.*, **3**, 200). E. W.

Note on the manufacture of simple Cyanides and Prussiates by the aid of Trimethylamine; process of Ortlied and Muller. E. WILLM.

The reaction indicated by Wurtz (Ann. de Chim. Phys. (3), **30**, 454), is used in this process. Commercial trimethylamine is vaporized and the vapors decomposed into hydrocyanic acid and ammonium cyanide by passing through red hot retorts. The vapors are first passed through dilute sulphuric acid, which takes up the ammonia, and then through solutions of potash soda, &c., to form the cyanides desired. The unabsorbed gas is used to illuminate the works. If prussiates are desired, cakes of ferrous oxide, prepared by precipitating ferrous chloride with milk of lime, and filtering by filter press, are introduced into the alkaline absorbers. The oxide dissolves as the cyanide forms. No unpleasant fumes whatever are produced in the process. (*Bul. Soc. Chim.*, **41**, 449.)

E. W.

On the effect of temperature in Dyeing. E. J. MILLS and A. G. RENNIE.

Experiments with purified cashmere wool and a 0.02 per cent. solution of rosaniline acetate showed that the maximum dyeing effect was produced at 31.1° C., the minima of effects being at —1.46° and +81.15°. Using the rosaniline salt in excess, the maximum deposition of color occurred at 39° C., the minima at about 0° and at 82°. With mauveine the maximum was at about 49° C., the minimum was calculated as —23.8° C., but on the other side was not reached at 85° C., though the diminution was quite marked. The conclusion is that where an aniline color is susceptible of dissociation there is a positive disadvantage in using high temperatures in the dye bath. (*Jour. Soc. Chem. Ind.*, **3**, 215.) E. W.

Standard methods of sampling and analyzing Commercial Products and of stating the results.

A conference on this subject in the Manchester Section.

The discussion was participated in by Messrs. I. Levinstein (chairman), Geo. E. Davis, Mellor, Watson, Smith, J. Carter Bell, Watson and Grimshaw.

Prof. Roscoe also had written a letter on the subject, which was read. There was on the part of most of the speakers a strong objection to fixing upon methods which must invariably be used by the analysts, but all agreed that more thorough and satisfactory methods of sampling should be used, and that analysts should not (as is frequently the case) be accused of inaccuracies for which they are really not responsible. The following resolution was passed : "That in the opinion of this meeting it would be practicable and very desirable to attain a national agreement on standard methods of sampling ores, raw products and chemicals, but that an international agreement would be at present impracticable." (*Jour. Soc. Chem. Ind.*, **3**, 210.) E. W.

On the existence of Manganese in Wines. E. J. MANU-MENÉ.

In three wines of Lower Beaujolais (vintage of 1865, 1882 and 1883) the author found considerable proportions of manganese. It appeared to exist in the wine as double tartrate of potassium and manganese. The proportion of metallic manganese in the wine of 1865 (red), was found to be 5 to 7 mgs. per litre, corresponding to 51.73 mgs. of double tartrate. The soil upon which the grapes grow is known to contain much manganese. Further investigation is proposed. (*Bul. Soc. Chim.*, **41**, 451.) E. W.

Abstracts of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

April 1, 1884.

295,931.—Manufacture of artificial stone.—M. McNamara.

Portland cement, sand, ground glass, plaster of Paris, pitch, paper-pulp, salsoda, litharge and alum.

295,968.—Coffee substitute and process of preparing the same.—C. Alvord.

Extract of willow bark or tulip-tree bark with corn, barley, wheat, rye, peas, or other amylaceous substance. The latter are saturated with the former and then dried and roasted.

295,988.—Metallurgical gas-furnace.—W. F. Durfee and T. Egleston.

296,000.—Apparatus for separating solid and liquid portions of starch refuse, &c.—P. H. Grimm.

A combination of mechanical devices for obtaining the above result.

296,033.—Reverberating gas-furnace.—W. L. McNair.

296,040, 296,041 and 296,042.—Apparatus for and process of cooling and drying sugar.—H. E. Niese and G. Dinkel.

The soft sugar, upon its discharge from the centrifugal machine, is immediately conveyed to suitable shutes and nozzles where it comes in contact with a strong blast of cold air, by means of which the particles of sugar are scattered, cooled and partially dried.

296,112.—Polishing compound.—H. H. Becker.

Bone-ashes and slate.

296,116.—Process of roasting and disintegrating gold, silver and copper ores.—D. W. Birmingham.

Prepares refractory ores for amalgamation by combining therewith lime, carbon, and common salt, or equivalents, roasting the mixture and then subjecting the same to a suitable bath.

296,159.—Lubricating oil.—J. E. Gill.

A lubricating oil composed of a compound of mineral or vegetable oil, and either an oxide or carbonate of lead, to which mineral oil is subsequently added, said compound being first raised to a temperature of 480° to 500° Fahrenheit, then reduced about 20° by adding mineral oil, and then raised again to the first high temperature before the rest of the mineral oil to be added is introduced.

296,187.—Apparatus for extracting oil from oleaginous substances.—W. Krutzch.

Not intelligible without the drawing.

296,197—Liquid for and process of generating a compound vapor as a motive power.—W. L. Lowrey.

Employs the vapor from mixtures of water and various alcohols in different proportions for operating steam or vapor engines.

296,200 and 296,201.—Process of manufacturing and apparatus for the manufacture of hydrocarbon gas.—W. F. M. McCarty.

Consists in passing superheated steam through or in contact with heated sulphate of lime and through or in contact with heated finely-divided metallic iron or copper, then mixing the gas so obtained with a liquid hydrocarbon, and converting the mixture into a fixed gas by heat.

296,206.—Process of enameling iron ware.—H. C. Milligan.

Adds to the paste after it has been prepared in any of the well-known ways, an additional supply of alkali solution sufficient to neutralize any acid which may be present in the paste.

296,258.—Rubber-surfaced fabric and composition therefor.—N. N. White.

A close textured fabric is surface-coated with a composition consisting of dissolved india-rubber and gutta-percha and a filling of zinc-white, sulphur or sulphide and aniline pigments consisting of aniline, china clay and precipitated silicate of soda. Other compositions are proposed, together with the methods of preparing them and fixing them to the fabric.

296,260.—Apparatus for the manufacture of bicarbonate of soda.—C. Wigg.

In a plant or apparatus for the manufacture of bicarbonate of soda, the combination of a series of absorbers, each provided with rotating perforated gas distributors and rotating cooling beaters, the absorbers connected by circulating pipes, a brine-purifying tank provided with a perforated diaphragm and connected with the absorbers by a brine-delivery pipe and a gas-inlet pipe, a carbonic acid gas generator provided with a vertically adjustable cage and connected with the absorbers by suitable gas-delivery pipes, and a series of filters, each connected with its respective absorber, and with an exhaust pump for maintaining a partial vacuum in the filters.

296,262.—Manufacture of spongy lead.—F. T. Williams and J. C. Howell.

Consists in inserting a perforated mould of the size and pattern of the block or plate required into a bath of the crystallized and molten metal, then removing the mould from the bath and allowing [the liquid metal to drain through the perforations.

296,263.—Water-proofed textile fabric.—I. F. Williams.

296,289.—Process of generating gas.—G. Jones.

Petroleum is fed in a small stream before a blast of superheated steam. Heat is applied at the moment of vaporization to prevent condensation.

296,290.—Gas generator.—G. Jones.

Oil is vaporized by steam, and oil vapor is mixed with steam in a hot retort. The oil vapor pipe leading from the spraying injector is provided with a steam jacket to prevent condensation of vapor before reaching the hot retort.

296,303.—Polishing liquid.—E. Ludwig.

Composed of Vienna lime, oil of turpentine, linseed oil and gasoline.

April 8, 1884.

296,824.—Fire and water-proof paint.—M. O. Fisher.

Coal tar, yellow ochre, mineral paint, sulphur, alum and talc.

296,326.—Depurated composite sugar, &c.—J. Gandolfo.

Compounded of cane sugar and grape sugar which has been liberated of its deliquescent salt and then reduced by shaving, sifting and drying.

296,337.—Apparatus for the purification of water.—A. R. Leeds.

Not intelligible without the specification and drawings.

296,357.—Process of and apparatus for reducing metals by electrolysis.—A. J. Rogers.

Electrolyses sodium or potassium chloride while in a fused condition and contained in a vessel with close-fitting covers having gas-tight passages leading therefrom; condensing apparatus, &c.

296,365.—Galvanic battery.—H. Thame.

Employs chlorochromic acid (Cr O_2 Cl_2) for charging the carbon cells.

296,709.—Process of separating precious metals from ores, &c.—E. H. Russell.

The process of separating from ores and metallurgical products gold, silver and copper free from lead, which consists in leaching the ore or product with a hyposulphite solution containing a soluble carbonate.

296,710.—Process of separating metals from ores and metallurgical products and from each other.—E. H. Russell.

First dissoves out the precious metals and lead from the ore or product by means of a hyposulphite solution, and subsequently adds to the mixed solution a soluble phosphate to cause the precipitation of the lead.

April 15, 1884.

296,722.—Fire proof paper.—D. N. Brown.

Asbestus and infusorial earth.

296,765.—Manufacture of white lead.—J. C. Martin.

Produces solutions of lead salts by dropping molten lead upon stationary or wetted surfaces, kept wet by jets or sprays of water or by occasional immersion in water, and dissolving the very small flakes or splashes of metallic lead so formed in a solvent.

296,816.—Triturating machine.—F. E. Boericke and G. Goll.

296,858.—Process of making zinc sulphide anhydrous.—T. Macfarlane.

Consists in heating hydrated sulphide of zinc to redness in the presence of chloride of zinc, whereby excess of air and oxidation are prevented by the fumes of the chloride of zinc, and discoloration and loss of covering power are avoided.

296,935.—Process of manufacturing cellulose from wood, &c.—C. F. Dahl.

Boils the same under pressure in a watery or hydrated solution containing sulphate, carbonate or hydrate of soda or sodium sulphide.

Also recovers some of the salts used by boiling with lime.

296,967.—Art of manufacturing celluloid and other compounds of pyroxyl-ene.—J. W. Hyatt.

Consists in effecting the displacement of the aqueous particles by means of pressure applied to a suitable liquid (alcohol, &c.) whereby the aqueous parti-cles are caused to leave the pulp, their places being occupied by the unob-jec'ionable liquid particles which can afterward be utilized as a solvent.

296,968.—Process and appara'us for effecting the desiccation of py-roxyline pulp.—J. W. Hyatt, W. H. Wood and J. H. Stevens.

Improvement on the Letters Patent No. 133,229, Nov. 19, 1872.

Form the pulp into a cake, which is repeatedly subjected to great pressure in contact with a surface of bibulous material.

296,969.—Manufacture of pyroxyline material.—J. W. Hyatt, J. H. Stevens and J. Everding.

Consists in first forming it into cakes or plates ; second, causing liquid solvents to flow over the cakes until a sufficient amount has been absorbed while the cakes are held apart ; and third, allowing the material to remain in an air-tight case for a proper length of time.

296,970.—Manufacture of celluloid and other compounds of pyroxyline.—J. W. Hyatt, J. H. Stevens and W. H. Wood.

A process in which pyroxline is first ground to a pulp, then pressed into cakes and dried, and the cakes softened with the required amount of liquid solvent by being formed into a pile with the solvent between the cakes, and then mixed or masticated in heated rolls or other suitable apparatus.

297,039.—Method of and apparatus for bleaching sugar.—O. B. Stillman and J. M. Stillman.

The granular sugar is subjected to the action of sulphurous acid gas in a rotating cylinder.

297,074.—Paint.—E. H. Hague.

For preserving materials and rendering them fire and water proof, consists of coal tar, sulphur, china clay, alum, salt and black oxide of manganese.

297,095.—Washing raw sugar and apparatus therefor.—J. H. Tucker.

Consists in forcing fine sprays of water or syrup against and into a falling shower of finely divided raw sugar. The magma so obtained is then heated and subsequently run into the centrifugal machine.

297,098.—Application of celluloid for enameling textile fabrics, &c.—W. H. Wood and J. H. Stevens.

Enamel cloth, leather or textile fabrics by means of sheets or veneer of py-roxyline material, and effect the adhesion of the sheet or veneer by subjecting it to heat and pressure while in contact with a dried surface of a cement con-taining oxidizable or drying oil.

Reissue No. 10,469. Original No. 105,338, dated July 12th, 1870; Re-issue No. 5,928, dated June 28, 1874.—Treating and molding pyroxyline.—J. W. Hyatt and I. S. Hyatt.

The use of finely comminuted camphor gum mixed with pyroxyline pulp, and rendered a solvent thereof by the application of heat.

April 22, 1884.

297,105.—Process of and apparatus for separating metals from their ores.—
A. H. Bliss.

Mechanical arrangements for moving and retaining the triturated ore under
the surface of the mercury in an amalgamator.

297,105.—Liquid Paint—G. T. Lewis.

White lead, oil and an alkaline solution of resin.

297,162.—Process of generating gas.—H. Pratt and J. J. Ryan.

Carbonic acid is reduced to carbonic oxide by incandescent coal, in the
usual way, and the gases mixed with volatile hydrocarbons and discharged
over the fire bed.

297,319.—Bleaching raw cotton.—J. C. Vanlohe.

Subjects the cotton in a compressed state, as in a bale, to the action of
bleaching liquids, then rinsing it, tearing apart and loosening it and finally
drying it.

297,323.—Apparatus for the manufacture of salt.—S. C. W·lls.

A furnace for evaporating the brine, combined with mechanical appliances
for raking and graining the salt.

297,854.—Composition for destroying the grape oidium.—H. de Chasse-
loup-Laubat.

Water, pentasulphuret of potassium and marine salt.

297,863 and 297,864.—Apparatus for filtering liquids—J. F. C. Farquhar
and W. Oldham.

A cylindrical vessel with perforated false bottom for holding pulverulent
filtering material and having a revolving cutter-head for removing the clogged
material continuously.

297,413.—Manufacture of ethyl-blue coloring matter.—A. Kern.

Produced by the condensation of alpha-phenyl-naphthylamine with tetra-
ethyl-diamido-benzophenone.

297,414.—Methyl-blue coloring matter.—A. Kern.

As a new product, the blue dye-stuff or coloring matter described in the
specification.

297,415.—Methyl-blue coloring matter.—A. Kern.

As a new product, the purple dye-stuff or coloring matter described in the
specification.

597,416.—Ethyl-blue coloring matter.—A. Kern.

Produced by the condensation of tetra-ethyl-diamido-benozophenone with
dibenzylaniline.

297,467.—Process of and apparatus for the treatment of hops in the man
ufacture of malt liquors.—A. Steinke.

Boils the mash *in vacuo.* Conducts lighter portions only of the evaporated
oil of hops back to the boiler.

297,480.—Process of separating metals from Franklinite ores. A. F.
Wendt.

Consists in selecting that portion of the ore containing practically only franklinite and willemite, separating these minerals according to their specific gravities, smelting the willemite for spelter and reducing the franklinite, by the Wetherell process for oxide of zinc, and finally smelting the residuum for spiegeleisen.   ●

297,502.—Absorber for ammonia ice-making apparatus.—M. S. Conly.

An outer shell containing a series of hollow-bottomed troughs for bringing the ammonia gas into contact with weak water of ammonia or water.

297,517.—Apparatus for the distillation of wood.—R. Haldane.

Adapted for the destructive distillation of sawdust, shavings, or other small wood. Consists of a retort with shelves, over which the material is passed by means of endless chains and finally discharged in the condition of charcoal. Also, cooler, feed and discharge-wheels, &c.

April 29th, 1884.

297,554.—Process and apparatus for the treatment of ramie and jute.—N. Arthurs.

297,568.—Composition for staining and preserving wood.—S. Cabot, Jr.

Composed of rectified creosote oil, or any of the distillates of coal tar which pass over between 125° and 200° centigrade, about fifteen per cent. of finely divided pigment and about ten per cent. of drying oil.

297,603.—Apparatus for improving the fire test of petroleum and for bleaching other oils.—J. B. Huston.

The oils are made to pass through a high vertical cylinder provided with several perforated floors, by means of which they can be reduced to a finely divided state, in which state they are subjected to the action of direct live stream or bleaching material.

297,626.—Indestructible compound for coating wires for electrical-purposes.—J. H. Page.

Litharge and glycerine formed into a thick paste.

297,689.—Process of manufacturing chair seats of vegetable fiber and chromic acid.—R. Shimmel.

Ground rags and vegetable fibre in equal parts, with chromic acid to make a paste which is formed into sheets and strengthened by the addition of textile fabrics and then molded and pressed into the pattern, &c., desired.

297,743.—Extraction of oils and fats from oleaginous and fatty bodies. I. A. Bang and C. A. Sanguinetti.

Consists in first reducing the substance to a finely divided state, then saturating it with a volatile deodorized product of petroleum, drawing off the free liquid, and then passing the superheated vapor of a portion of the volatile liquid through the mass in order to remove therefrom the remainder of the volatile solvent.   ♦

297,766.—Process of preparing ozocerite and other solid hydrocarbons.— J. C. O. Chemin.

First removes the earthy portions, distils the so-purified hydrocarbon mixed with flowers of sulphur, removes the oils and lighter hydrocarbons by means of heat and pressure, fuses in a bath with amylic alcohol, cools and presses them and treats with animal charcoal while in a molten state.

297,770.—Finishing and glossing the surfaces of fabrics having a coating of some pyroxyline compound.—J. B. Edson.

Improvement on patents Nos. 289,240 and 289,242, dated Nov. 27, 1883 and No. 290,553, dated Dec. 18, 1888. Consists in passing them through a fluid acting as a solvent for the zylonite or similar material and which upon evaporation leaves the desired glossy appearance.

297,791.—Concrete compound for paving streets, walks, &c. L. Haas.

Composed of furnace slag, gravel, Portland cement, metallic screenings obtained by washing ores, glass, cinders, wood and coal ashes, Trinidad asphaltum, coal tar pitch and refuse slate for coloring matter.

297,844.—Sulphoconjugated violets of Paris.—A. F. Poirrier and D. A. Rosenstiehl.

Consists in treating the crude coloring matter with potash soda, ammonia, zinc, magnesia or other suitable base, so as to transform the excess of acid into soluble sulphate.

The produut of the described treatment is also patented.

297.848.—Process of and apparatus for defecating cane juice.—W. A. Riggs, Sr.

Consists in first boiling it as soon as it comes from the mill, removing the skimmings and in drawing off the boiled juice or sirup into suitable tanks, wherein it is treated with lime or other other alkalies.

297,852.—Manufacture of yellow and orange coloring matters.—Z. Roussin and D. A. Rosenstiehl.

Improvement in the preparation of coloring matters varying from yellow to orange, and even red, consisting in substituting the amidocarboxylated acids, such as amidobenzoic acid (C_6 H_4 NH_2 CO_2 H)—for the corresponding sulpho acids—such as the sulpho acid C_6 H_4 NH_2 SO_2 H—in the manufacture of azo-coloring matters, in the state of free acid, these coloring matters being insoluble in water, but their alkaline salts being sufficiently soluble for practical purposes.

897,888.—Furnace for smelting ores.—J. W. Webb.

297.935.—Process of desiccating pyroxyline in comminuted form. J. W. Hyatt.

Grinds the nitro cellulose in water and then removes the aqueous particles by agitating the nitrocellulose in contact with an absorbent.

297,948.—Apparatus for taking off ammonia from boneblack retorts.— F. Osmer.

Improvement on Patent No. 287,570, dated Oct. 30, 1883.

A pipe of similar cross-section as the retort extends a certain distance into the latter. The other end of the pipe is connected with a flue for conducting away the ammonia or other noxious gases.   O. H. K.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Regular Meeting, September 19th, 1884.

The meeting was called to order at 8:30 P. M. Prof. A. R. Leeds in the chair.

The minutes of the meeting of June 6th were read and approved. The chairman read the titles of recent additions to the library.

The following papers were read : Toughening (Purification) of Gold and Silver in the Crucible. James C. Booth, Ph. D.

Zinc in Drinking Water. F. P. Venable, Ph. D. Discussion by Messrs. Stebbins, Mackintosh, Breneman and Wheeler.

Action of Ammonium Hydrate on the Halogen Salts of Lead. Julian Wood and J. S. Borden of the University of N. C.

Rate of Reversion of Phosphates prepared from Red Navassa Rock, W. B. Phillips, Ph. D.

Reversion of Phosphoric Acid by heat, together with some observations on the fine grinding of analytical samples, W. B. Phillips, Ph. D.

Some Cotton-seed Analysis, E. A. De Schweinitz.

Decomposition of Potassium Cyanide, J. F. Wilkes.

The following gentlemen were proposed for membership: George H. Weiss, 100 Bedford avenue, Brooklyn, E.D., proposed by P. Casamajor, A. A. Breneman, H. Endemann. Conrad Baker, jr., 215 Pearl street, New York ; proposed] by] P. Casamajor, A A. Breneman, H. Endemann.

The meeting was then adjourned.

<div align="right">
C. E. MUNSELL,

Recording Secretary.
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PROF. HOFMANN'S LETTER.

The following letter from Prof. A. W. Hofmann will explain itself:

10 DOROTHEA STREET, BERLIN, June 30th, 1884.

My Dear Sir :—I hasten to acknowledge your kind letter, dated June 12th, announcing to me the new honor conferred upon me by my American friends and colleagues.

And a great honor I consider it to become the successor of my dear old friend Prof. Wöhler. The value I attach to my election into the place made vacant by his death, will be best appreciated by a glance at a short biographical sketch of Wöhler, which I published some time ago, and of which I forward a copy for the library of the Society.

May I ask you, my dear sir, to be, with my new colleagues, the interpreter of my sense of gratitude.

Ever yours most sincerely,

(Signed,)   A. W. HOFMANN.

P. CASAMAJOR, Esq.,

Secretary of the American Chemical Society.

TOUGHENING (PURIFICATION) OF GOLD (SILVER, &c.), IN THE CRUCIBLE.

By JAMES C. BOOTH, PH. D., MELTER AND REFINER, U. S. MINT.

In all operations in the Arts, economy, especially the avoidance of needless wastage, is of importance, in direct proportion to the value of the material operated on.

While a loss of 10 per cent. may be and is tolerated in working iron in the fire, the United States Government holds the officers of Mint responsible, in working gold, for any wastage beyond .001 ($\frac{1}{10}$ of one per cent.), and in silver, beyond .0015. In practice, the actual loss is usually far within that range. In general, the tolerance of loss, in working the metals, is inversely as their commercial value.

The recent progress of knowledge and skill, in the Arts, is well shown in the improved commercial character of some of the commoner metals. When I first examined the copper of commerce, in 1850, with reference to its use for minor coinage, or for alloying gold, and silver, coin, I found that a large amount of the best commercial article contained about 98 per cent. copper, and that it often made hard or brittle alloys. We now employ copper averaging 99 per cent. pure, with small quantities of nickel, silver, oxygen, silica, and the usual intruder into everything on earth, iron. In a few instances, 50,000 lbs. of extra refined copper (from Pope, Cole & Co., Baltimore, Md.), yielded, to a specially fine analysis (by Booth, Garrett and Blair), about 99$\frac{3}{4}$ per cent. copper. In like manner, a remarkable change has occurred in the silver market. About 1850, the best commercial silver usually assayed 99 per cent., and in 1853, I took credit in exhibiting a pile of about ten tons of silver, that averaged nearly 99$\frac{5}{10}$ per cent. At the present time, a large amount of the good silver of commerce, from the mining regions, averages 99$\frac{9}{10}$, and sometimes attains 99$\frac{99}{100}$; failing only by $\frac{1}{10000}$ of absolute purity.

The gold of commerce generally requires toughening, or purifying, to fit it for coinage, or jeweler's use, as it consists of bars, with silver, somewhat improved by melting,—of lumps and grains of ore, —and of old jewelry, containing tin, lead, zinc, and all the cheap elements that ingenuity, greed, and deception can use to dilute and cheapen the precious metal, without wholly obliterating its coveted

yellow color, and its toughness. Some really tasteful jewelry, of fair quality to the eye, which chooses to judge for itself, contains only one-fourth of gold, and some still less.

The lumps and grains are melted to drive off mercury, &c., and are then refined, together with good silvery bars, by acid processes, termed quartation, or parting. Where tin is present, as in jewelry, the nitric acid process is preferable, and after thoroughly washing out nitrates, muriatic acid, drenching the residue, dissolves out the tin, and the residue is pure gold. Iron is a frequent enemy to the ductility of gold, an extremely small percentage rendering it hard or brittle, as in the case quoted in "Jour. Amer. Chem. Soc., vi. 182." The principle, there developed, is to remove all the embrittling elements, with the least practicable quantity of the valuable metal, on one side (to be subsequently purified); and on the other, to have all the rest of the gold, practically pure. The loss of gold, in the fire, is in proportion to the length of exposure, and to the quantity exposed; and the process described eminently guards these points. A single practical illustration will make the principle clear. Suppose a melt of 5,000 ozs. of gold, containing .001 (5 oz.) embrittling impurity, is separated, by a short working in the fire, into 100 oz. skimmed off impurity (consisting of 95 oz. gold, and 5 oz. of embrittling matter, together with flux), and 4,900 oz. practically pure gold; then only 95 ozs. are exposed to further possible wastage, in the fire.

TOUGHENING, OR PURIFYING, SILVER FROM LEAD, &C.

The principles, and to some extent, the practice, above applied to gold, may be applied to silver, adulterated with lead, tin, zinc, &c.

In spite of the great improvements in preparing silver bars for the market, as noted above, we often received them alloyed with lead, &c., and quite unfit for coinage, some 10 or 15 years ago. Recently they have generally been unexceptionable. There was no reason for having inferior silver in the market, because the Western smelters then had cupels, and knew how to use them, but the lower price of the inferior silver was an irresistible temptation to a purchaser. I bore the brunt of the mistaken purchase, for the question given to me for solution was, to refine a few tons of plumbic silver, without a cupelling hearth; for even if I had desired

one, there was no room for its erection in the Mint. Since I solved the question successfully, and by a rather novel method, it seems to be worth describing. At one time I smelted a lot of some 50,-000 ozs. of commercial silver bars, in melts of about 3,500 ozs. each, and treated each melt in the same way, as follows: It was melted, with the addition of about an ounce or more of anhydrous borax, which greatly facilitates fusion, and, to a limited extent, prevents volatilization, although forming only a paper-thick covering to the melted metal. A covering of bone-ash ($\frac{1}{8}$ to $\frac{1}{4}$in. thick), having been sprinkled over the surface, crystals of soda-nitre are here and there dropped through the covering, and after effervescence has somewhat progressed, a black lead dipper, held in the tongs, is moved around the top, in interlacing circles, to spread the oxidation, and the metal is then more thoroughly mixed by plunging the dipper to the bottom of the metal, moving it up and down, once or twice, and, after lifting it out full, by pouring it back into the metal. This operation, of oxidizing throughout, is advantageously repeated, and more than once, if the silver is known to be foul with lead. All these operations being rapidly performed, the surface is hastily skimmed by a triangular crucible (so as to have always a flat side for skimming), experience guiding the melter to take off all the fluxed matter, with as little silver as is conveniently practicable. The whole time of oxidation, and skimming, is of but a few minutes duration, so that no chance is given to the oxidized metals to revert to the metallic condition, in the presence of their tempters, carbon and melted metal. The processes of oxidizing, and skimming, are repeated until the *look* of the remaining silver, or the test of a cast strip, proves sufficient purity of metal. In the case here specially noted, the working of 12 melts occupied between one and one and a-half days to resolve them into over 49,000 oz. of silver sufficiently pure and tough for coinage, and less than 1,000 ozs. of silver with litharge, and other oxides, in the skimmings. These last consist of bone-ash, cemented by litharge, borax and alkali, into mixed soft and hard sponge, or brick, with some grains of silver entangled in the mass.

The treatment of the skimmings constitutes the chief, and, I believe, novel peculiarity of the process. The whole residues having been charged into pots, with the addition of some charcoal, to aid in reducing the litharge, and of pearlash, to make the slags thinner,

was melted in a covered crucible, at a full red heat, and allowed to cool quietly, so as to make a king of all the reduced metal, with a cinder or slag above it. When cold, the slag and cinders were ground and sifted to recover metallic grains. The cold kings were put into a crucible, and gradually heated, by a long continued heat, from below the melting point of lead, to a full red heat, and the eliquated metal, at different heats, collected separately. The first runs were nearly pure lead, so as to be cut with the same facility as the soft lead of commerce.

There was only a slight wastage of silver in all the above operations, and but little loss of lead. I found the whole process a very short method of procuring nearly the whole of the silver from its obstinate alloy with lead, and attended with a trifling wastage; and I have good ground for believing that a little experimental practice might easily lead to its further improvement, so as to be substituted for cupelling, where the latter is not convenient. The depressed hearth of a reverberatory might readily be used as the black lead crucible, and other modifications devised according to the exigencies of the case. These remarks are not designed to disparage the admirable process of cupellation, but merely to show that we are not necessarily confined to the last. In fact, the process I have indicated is cupellation, with a movable cupel, and oxysalts used instead of a blast.

It is hardly worth drawing the plain conclusion that where lead is thus removed from silver, zinc, tin, antimony, &c., will be oxidized at the same time, and caught either in the metallic residues (kings,) or as oxides in the cinders. So efficient, economical and easy of execution, is the process, that one leaps to the conclusion that where silver contains one or more of the above oxidizable metals, lead may be added and the whole worked off with ease. Direct trial has proved it.

PURIFICATION OF PHOSPHOR-BRONZE.

The question having been propounded to me about a year ago by a worker in copper alloys, of removing the phosphorus from phosphor-bronze, I applied the principle herein developed, of using the greater oxidizability of the phosphorus and skimming it off, with a cover of lime on the melted metal. Although I had the time of but a half day to test the process, and in spite of no previous experience in skimming, I succeeded so far as to prove that a simple and effectual process can readily be evolved from the hints I have given in this paper.

ZINC IN DRINKING WATER.

By F. P. Venable, Ph. D.

The increase in the use of galvanized iron, especially in the form of water tanks and pipes, has lead to a reopening of the question as to the possible injurious effects from the use of such water. It is a matter of importance then to us how far our knowledge extends on this subject, and I will collect here all of the known facts so far as I have been able to get at them.

The so-called galvanized iron is of course nothing more than iron dipped in a bath of zinc and so superficially coated with it and to a certain extent alloyed with it. The character of the protection afforded the iron is galvanic (hence the name), the two metals forming a galvanic couple, so that under the action of any exciting liquid, the zinc and not the iron is attacked. That zinc dissolves in potable waters has long since been shown by the experiments of Boutigny, Schaueffele and Langonné. Distilled water and rain water dissolve it more readily than hard water. Especially is water containing carbonic acid capable of this solvent action. So much may be taken up that the water becomes opalescent and acquires a distinctly metallic taste. It seems that by the action of water, hydrate and carbonate of zinc are gradually formed, and that this action is more rapid in the presence of certain saline matters, but is weakened by the presence of calcium salts.

As to the injurious effect of such waters, authorities differ. Fonssagrives has investigated the question, consulting the statistics of the French Navy and the recorded experiments of others, adding, however, none of his own. The French Government had, before this, appointed a committee to make a special report on the subject, and the investigations of Roux in 1865 and 1866, furnished evidence enough of possible injury to health from water stored in galvanized iron tanks to lead to an order, from the Minister of Marine, prohibiting the use of such tanks on board of ships of war. Boutigny attributed grave effects to the use of these zinc-containing waters, looking upon it as probably resulting in epilepsy. Fonssagrives, however, maintains that the zinc is not cumulative and produces no bad effects unless taken in large doses. Doubt is thrown on this position, however, by the fact that his assertions as to the limited solubility of zinc in ordinary drinking water are not sustained by experiments. Without doubt such waters have been used for con-

siderable lengths of time and no injurious effects have been noticed. This may have been due, however, to the hardness of the water, and hence the small amount of zinc dissolved. Pappenheim states in contradiction to the assertion of Fonssagrives that zinc vessels are dangerous and must be carefully avoided. Dr. Osborne, of Bitterne, has frequently observed injurious effects from the use of waters impregnated with zinc. Dr. Stevenson[1] has noticed the solvent action of rain water on galvanized iron and states that probably its continued use would cause injury to health. He recommends as a convenient test for the presence of zinc in potable waters, the addition of potassium ferocyanide to the filtered and acidulated water. Zinc gives a faint white cloud or a heavier precipitate when more is present. Dr. Frankland[2] mentions a case of zinc poisoning where well-water, containing much dissolved oxygen and but little carbonic acid, was used after passing through galvanized iron pipes. Prof. Heaton[3] has recorded the analysis of a spring water in Wales, and a second analysis of the same water after passing through half a mile of galvanized iron pipe, showing that the water had taken up 6.41 grains of zinc carbonate per gallon.

A similar instance of zinc-impregnated water has come under my own observation, and I append the analytical results. The water from a spring 200 yards distant was brought by galvanized iron pipes to a dwelling house and there stored in a zinc lined tank which was painted with white lead. The water became somewhat turbid and metallic-tasting and its use for drinking purposes was discontinued. Analyses were made after the pipes had been in use about one year. A somewhat full analysis of the spring water was made under my direction by Mr. J. C. Roberts. The analyses of water from the tank and directly from the pipe, I carried out only so far as zinc, iron, and tests for lead were concerned. The results are calculated in grains per gallon of 231 cu. in.:

ANALYSIS OF SPRING.

Silica _____2.45 grains.
Lime _____ .23   "
Magnesia _____ .17   "
Alkalies _____ .43   "
Chlorine _____ .35   "
Sulphuric acid_____ .19   "
Carbon dioxide (calculated)_____ .45
Total residue on evaporation_____4.34

1. Chem. News, 49, 107.
2. Chem. News, 49, 115.
3. Chem. News, 49, 85.

The tank contained 4.48 grains of zinc carbonate per gallon with a trace of iron and no lead. Water from the pipe gave 4.29 grains of zinc carbonate per gallon and a trace of iron.

It is evident then, when the dangerous nature of zinc as a poison is taken into consideration, that the use of zinc-coated vessels in connection with water or any food-liquid should be avoided.

Chemical Laboratory, University of N. C.

SOME COTTON-SEED ANALYSES.

By E. A. DeSchweinitz.

The interest attaching to the variation in the percentage of fats yielded by different varieties of cotton-seed, has led to the analysis of several American and foreign seeds, with results as tabulated.

Table I. gives a food stuff analysis of the kernel, and table II. the value of the raw seed as to its ash, and possible yield of fats.

In all cases the fats were extracted with ether, the proteins calculated from the percentage of nitrogen, the fat-free residue was washed with NaHO and $H_2 SO_4$ to find the crude cellulose and the carbohydrates obtained by difference. The calculations are all made on the air-dried seed. Eight varieties in all were examined.

No. 1. Belongs to the botanical species Gossypium hirsutum; generally supposed to be a variety of the Gossypium Barbadense. It is called the "Duncan" cotton, comes from the eastern part of the State, was grown on sandy land with a yield of 400 pounds to the acre.

No. 2. Also Gossypium hirsutum, known as the "Heavy Boll Prolific," was grown on sandy loam in the central part of the State with a yield of 300 pounds to the acre.

No. 3. Gossypium hirsutum, known as "Sea Island" cotton grown for one year on clayey loam in the central part of the State with a fair yield.

No. 4. Is known as the "Hodge" cotton, was grown on sandy upland with a yield of between 300 and 400 pounds to the acre.

No. 5. Known as the "American Cotton Tree," is a variety not cultivated for commercial purposes but grows wild on marsh land in warm districts. The seed shows a noticeably high percentage of ash

and fats. The tree being fairly large probably concentrates a large amount of mineral matter in the seed for its use in germinating.

No. 6. Gossypium Barbadense, is an Egyptain cotton.

No. 7. Belonging to the same variety is from the West Indies ; and No. 8, is from the " Red Cotton " of Southern Russia. These last seeds were small, of a gray color and had a slightly musty odor, showing that they had probably undergone a slight change. This may account for the very low percentage of fats.

Experiments in selecting seed and cultivation with a view to increasing the yield of fats and the nutritive ratio would be interesting and valuable. As the use of a dominant ingredient, potash, in the fertilizer is found to increase the percentage of sugar in the beetroot, so the use of a special fertilizer on the cotton mght be made to increase the value of seed as well as of the fibre. As soil and climate effect the quality and yield of the cotton, so is the seed influenced. The same variety consequently shows variations in different seasons and localities and even in the same field.

I. KERNEL.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Moisture @.100° C........	7.06	7.25	7.50	7.23	6.45	8.81	7.46	6.94
Ash........	4.91	4.15	3.51	4.23	5.41	4.96	4.45	4.92
Fats................ ...	34.42	40.39	39.76	38.09	44.70	34.54	36.77	32.71
Crude Cellulose......	4.70	3.43	4.24	4.21	4.06	4.33	5.12	5.00
Protein Nitro. Matter.....	30.25	27.94	23.44	27.68	21.62	27.25	28.81	35.18
Carbohydrates, N.-free Extract...................	18.64	16.84	21.55	18.56	17.76	16.11	17.29	15.25
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Nitrogen..	4.84	4.47	3.75	4.43	3.46	4.38	4.61	5.63
Equiv. to NH₃..	5.87	5.42	4.55	5.38	4.20	5.29	5.59	6.81
Nutritive Ratio...........	1:1.90	1:2.17	1:2.80	1:2.19	1:3.07	1:2.13	1:2.05	1:1.50
II. Whole seed—Kernel, Hull.								
Ash.....................	4.26	3.46	3.26	3.40	4.27	3.62	3.47	4.12
Fats.....................	19.71	20.19	19.88	19.04	22.35	19.27	18.38	16.35

Laboratory, University of N. C.

ACTION OF AMMONIUM HYDRATE ON THE HALOGEN SALTS OF LEAD.

By Julian Wood & J. L. Borden.

In Watt's Dictionary (III. 556) we find the statement that by decomposing lead chloride with ammonia a hydrated oxychloride $Pb_4Cl_2O_3 . H_2O$ is obtained. As certain observed facts seemed to disagree with this, a set of experiments were undertaken to determine what oxychloride or oxychlorides were formed by this action of ammonium hydrate and the conditions of formation.

The lead chloride for these experiments was gotten by precipitating pure lead nitrate with hydrochloric acid. The precipitate was thoroughly washed and dried. To about 7 grains of this chloride 140 c. c. of ammonia solution was added, the mixture being heated then some six hours upon a sand bath. The residue was washed, dried and analyzed with the following results :

I. .6200 grams of substance gave .3585 grams AgCl. p. c. Cl.=14.20.

The water was determined and Cl. calculated on a dry basis=14.68.

II. .5003 grams of substance gave .2950 grams AgCl. p. c. Cl.=14.57.

No water in the specimen.

III. .5650 grams of substance gave .3265 grams AgCl. p. c. Cl.=14.29.

Calculated water-free=14.54.

IV. 1.3345 grams of substance gave 1.5340 grams $PbSO_4$. p. c. Pb. 78.52.

Water-free=81.14.

V. H_2O in air dried substance=3.33 p. c.

			I.	II.	III.	IV.	V.
Pb_2	Calculated, p. c. 82.56.	Found, p. c.				81.14	
O	"	" 3.31	"	"			
Cl_2	"	" 14.13	"	" 14.68	14.57	14.54	
H_2O	"	" 3.46	"	"			3.33

Again, between ten and eleven grams of the chloride was heated with 175 c. c. ammonia solution for twelve hours on a water-bath, then washed and dried as before.

I. .145 grams of substance gave .0525 grams AgCl. p. c. Cl.=8.61.

Water-free=8.70.

II. .4935 grams of substance gave .1490 grams AgCl. p. c.
Cl.=7.48.

Water-free=7.56.

III. .5035 grams of substance gave .1594 grams AgCl. p. c.
Cl.=7.81.

Water-free=7.89.

IV. 1.5353 grams of substance gave 1.9420 grams PbSO$_4$ p. c.
Pb=86.31.

Water-free=87.26.

				I.	II.	III.	IV.
Pb$_4$	Calculated, p. c.	87.53.	Found, p. c.				87.26
Cl$_2$	"	" 7.48	"	8.70	7.56	7.89	
O$_2$	"	" 4.99					

These two experiments, then, would point to the formation of
two entirely different bodies, the first having the formula PbCl$_2$.
PbO. H$_2$O., the second the formula PbCl$_2$. 3PbO. H$_2$O.

The most plausible explanation of this difference of action seemed
to be that in the case of the substance heated upon the sand-bath
lthe mixture was kept boiling briskly at the higher temperature, the
oss of ammonia was consequently more rapid, and, for a portion of
the time, whatever oxychloride had been formed was subjected to
the action of a boiling solution of ammonium chloride.

To test the correctness of these results two equal amounts of the
chloride (about five grams) were taken, ammonia solution added
and the two then heated, one upon the sand-bath and the other upon
the water-bath. As the one on the sand-bath was kept at a brisk boil,
evaporation was faster and more of the ammonia had to be added
to replace that which was thus lost. Hence to the chloride upon
the sand-bath 145 c. c. were added, whereas 65 c. c. sufficed for that
heated on the water-bath. The object was to keep the ammonia
solution strong enough to give always a decided smell of ammonia.
Once or twice, however, that upon the sand bath became very
weak.

The residue from the sand-bath mixture was washed. The sub-
stance was creamy yellow and was unchanged by heating up to
200° C.

I. .5060 grams of substance gave .2745 grams AgCl. p. c.
Cl.=13.41. Water-free = 13.89.

II. 1.2700 grams of substance gave 1.4780 grams $PbSO_4$ p. c.
    Pb = 78.45.   Water-free = 81.26.

				I.	II.
Pb calculated p. c.	82.56	found p. c.			81.26
Cl_2 "	"	14.13	"	"	13.89	
O "	"	3.31	"	"		

The formula then is $PbCl_2$. PbO.

The residue from the water-bath was much yellower and became a deep yellow on heating. The analysis gave the following results :

I. .520 grams of substance gave .1370 grams AgCl. p. c.
    Cl. = 6.51.   Water-free = 7.28.

This corresponds with the per centage of chlorine calculated for the tribasic chloride $PbCl_2$. 3PbO.

For the experiments with the iodide conducted by Mr. Borden, lead iodide was prepared by precipitating pure lead nitrate with pure potassium iodide and thoroughly washing and drying the precipitate. In the first set of experiments three portions were taken. One was heated on the sand-bath ten hours, the second a similar time on the water-bath, the third was covered with ammonia solution and set aside for three days at a temperature of 15—20° C. In the first two instances no precautions were taken to keep a strong solution of ammonia over the iodide. In the analyses, lead alone was determined as pointing with sufficient accuracy to the nature of the body formed. Corrections were made for the percentage of water retained in the powders analyzed. Generally two simultaneous lead determinations were made of each substance. The means of concordant analyses are given :

1. Substance heated on water-bath gave ___62.50 p. c. Pb.
2. Substance heated on sand-bath gave ____60.11 p. c. Pb.
3. Substance standing in the cold gave____58.82 p. c. Pb.

Calculated for PbI_2. PbO, p. c. Pb = 60.51. Calculated for PbI_2. 2PbO, p. c. Pb. = 68.45.

From this it would seem that the ammonia which was only moderately heated had the greatest effect; that which was not heated at all had the least.

In the second set of experiments the heating lasted only seven hours (the mixture stood three days before heating) but care was taken to insure a strong solution of ammonia always covering the iodide. The results were as follows:

    1. Substance heated on water-bath gave ___64.13 p. c. Pb.
    2. Substance heated on sand-bath gave____63.25 " "

Another set heated ten hours without previous standing were analyzed :

    1. Substance heated on water-bath gave___61.60 p. c. Pb.
    2. Substance heated on sand-bath gave____ 60.37 " "

From these results it is seen that the longer ammonia is allowed to act upon the iodide, the more iodine is removed, and hence the more oxide of lead formed. To test this, two portions were taken and the ammonia allowed to act on one for 38 hours (heating it on the water-bath); on the second 68 hours. The analyses were as follows :

    1. Substance heated 38 hours gave _____74.10 p. c. Pb.
    2. Substance heated 68 hours gave _____78.94 " "

Calculated for PbI_2. $3PbO$, 73.26 p. c. Pb; for PbI_2. $4PbO$, 76.38 p. c. Pb.; for PbI_2. $5PbO$, 79.31 p. c. Pb.

These experiments then would lead to the following conclusions :

1. By the action of ammonia in the cold the monobasic oxyiodide of lead is formed.

2. By heating the solution we get oxyiodides, the basicity of which is determined by the length of heating. If, by the more active boiling upon the sand-bath, the ammonia solution becomes weak, then the tendency is to form the monobasic oxyiodide. The oxide of lead previously formed reacts upon the ammonium iodide, forming lead iodide and setting free ammonia.

In the case of the action of ammonia on lead chloride as examined by Mr. Wood, it seems that the oxychloride formed is not dependent upon the time of heating, but a definite oxychloride is formed whether heated six, ten or fifteen hours, provided the chloride is kept covered with an excess of ammonia. If, by active boiling on the sand-bath, the ammonia solution becomes too much weakened, then a definite oxychloride is formed, independent of the number of hours the solution is heated. Some of Mr. Wood's experiments were repeated to test these conclusions.

Chemical Laboratory, University of N. C., May, 1884.

DECOMPOSITION OF POTASSIUM CYANIDE.
BY J. F. WILKES.

Entomologists frequently find it convenient in killing insects to use a bottle containing moistened potassium cyanide over which plaster of Paris is spread. The insect usually dies in a few minutes after enclosure in the bottle, the mixture assumes a brownish tint and the odor of hydrocyanic acid can easily be detected. As no explanation of this reaction could be found, some experiments were undertaken with a view to deciding the effect of the plaster of Paris and how far it is necessary for the reaction.

To determine the nature of the gas given off, about one grain of pure potassium cyanide (only the chemically pure was used throughout these experiments) was placed in a test-tube, moistened with water and covered with a layer of plaster. Through an accurately-fitting cork two bits of tubing entered this test-tube, one extending nearly to the surface of the mixed substances and having its other end connected with a washing flask containing a strong solution of sodium hydroxide ; the other just entered the cork and was connected with a calcium chloride tube to which was joined a tube, 300 m. m. long, filled with mercuric oxide. A smaller tube from the end of this dipped beneath a solution of potassium hydroxide. By means of an aspirator, air was drawn through this system of tubes slowly and at regular intervals for about two days. At the end of this time the potassium hydroxide was tested with the ferroso-ferric solution and no trace of prussian blue could be detected. The calcium chloride and mercuric oxide tubes were then removed and air once more drawn through into a solution of potassium hydroxide. On testing this the reaction for hydrocyanic acid with the ferroso-ferric solution was very clearly given. Here then was proof that hydrocyanic acid and no cyanogen was formed during the reaction. As a confirmatory test, however, hydrochloric acid was added to a portion of the potassium hydroxide through which the gas had been drawn, then sodium hydroxide, and it was heated to boiling. No ammonia could be detected. There was therefore no potassium cyanate present and hence no cyanogen had entered the liquid.

The aqueous solution of potassium cyanide can be kept unaltered in closed vessels at ordinary temperatures according to Pelouze and Geiger (Gmelin's Hand-book, vii, 415), but when boiled it is resolved into ammonia and potassium formiate. It is well known that a strong

smell of ammonia can be detected on opening a bottle containing moist cyanide, but we have seen no mention of the formation of hydrocyanic acid from the cyanide by simple decomposition without the aid of carbon dioxide or any strong acid. It was noticed during these experiments that when moistened potassium cyanide was enclosed in a test-tube and air aspirated over it for several days a slight but distinct prussian blue test was given by the solution of potassium hydroxide through which the air after leaving the tube was drawn. Of course every precaution was taken to free the air from all traces of carbon dioxide or acid. It was made to pass through a wash bottle containing a concentrated solution of sodium hydroxide, then through two U tubes filled with small lumps of solid hydroxide, and lastly, to have proof of the absence of carbon dioxide, through a small tube containing lime water, passing thence into the tube containing the cyanide. This experiment was repeated at various temperatures ranging from 12°—18° C. and always with the same result. If the amount of moisture was small, the depth of color gotten in the ferroso-ferric test was slight. If about 1 c.c. of water was used to 1 gram of the cyanide a clear deep green was gotten. With calcium carbonate, ordinary hydrated calcium sulphate or barium sulphate, the cyanide when mixed in about equal parts and moistened gave off apparently about the same amount of hydrocyanic acid as when alone, judging from the depth of color in the ferroso-ferric test. With the anhydrous sulphate a distinct blue was gotten, showing a decidedly increased decomposition, and in this case the mixture left in the tube had a purplish brown color which was not observed with the others.

Since other sulphates and other calcium compounds failed to act on the potassium cyanide and no change in the anhydrous sulphate itself could be detected, it seemed probable that its action was due in some way to its power of combining with a portion of the water present to form the hydrated sulphate. When an excess of water, 3–5 c.c., was added to the mixture of the cyanide and the anhydrous sulphate, the test showed very little, if any, more hydrocyanic acid to be given off than when the hydrated sulphate or the cyanide alone was used and no discoloration was produced. When barely moistened the evolution of hydrocyanic acid was considerable. If porous, partially dehydrated calcium chloride was added to the cyanide in the place of the sulphate the amount of acid

evolved was still greater and the color of the mixture almost black. Anhydrous sodium carbonate had the same effect, though in a lesser degree. Again, when the cyanide and the plaster had both been carefully dried the air was drawn over them for four days and no hydrocyanic test could be gotten in the final tube of potassium hydroxide.

The mixture of potassium cyanide and anhydrous calcium sulphate left after two or three days of aspirating was examined and found to contain potassium hydroxide. The reaction then is probably

$$KCN + H_2O = HCN + KOH.$$

It has been shown by Karsted (Poggendorff's Annalen, 115,348) and Storer (Amer. Chem. Journal v. 69) that where air alone comes in contact with corks and organic connectors carbon dioxide is formed. This would probably account for decomposition when potassium cyanide and water alone were used, but the greatly increased depth of test when plaster of Paris is added shows a decided action on the part of that body.

Chemical Laboratory, University of N. C.

RATE OF REVERSION IN SUPERPHOSPHATES PREPARED FROM RED NAVASSA ROCK.

By W. B. Phillips, Ph. D.

The manufacture of a high grade superphosphate from Red Navassa rock is one of those problems which, appearing easy of answer, yet present great difficulties. How great these difficulties are, only the manufacturer knows. Working formulæ which on other natural phosphates give entire satisfaction, on red Navassa give curious and rather discouraging results. In this rock we have to deal with a mixture of the phosphates of calcium, iron, and aluminium, and the oxides of iron, and aluminium. The superphosphate made from it is consequently of a more complicated structure than that made almost entirely of tri-calcium phosphate, i. e., from bone, or Apatite, or Charleston Rock.

In the superphosphate itself, the rapidity with which reversion takes place is largely dependent upon the content of iron and

aluminium. In most cases, if all the phosphoric acid has been ren-
dered soluble, the reversion proceeds slowly. But if any unattacked
iron and aluminium oxides are present, the reversion proceeds rap-
idly. (Compare H. Joulie, Compt. Rendus 88, 1879, p. 1324, and
Carl Ferd. Meyer, Zeit. An. Chem. 1880, p. 309.)

I have recorded in the following tables the results of some observa-
tions made on superphosphates prepared from red Navassa rock.
The material used was of uniform fineness, the whole of it passing
through a 60 mesh sieve. The samples were prepared so that in one
there should be about 5 per cent., in another about 8 per cent., and
in the third about 14 per cent. soluble phosphoric acid.

The same method of analysis was used in every case. All the
phosphoric acid determinations were made with ammonium molyb-
date. For the estimation of insoluble phosphoric acid there was
used a slightly alkaline solution of ammonium citrate, 100 c. c. to
2 grms., time 30 mins. Some of the comparative determinations of
insoluble phosphoric acid had to be omitted from lack of time, but
it is hoped that those that appear will prove to be sufficient for the
end in view. The reverted phosphoric acid was determined by
difference.

TABLE I.

Calculated on dry basis.				3d day after Mixing.	10th day after Mixing.	17th day after Mixing.	4th week after Mixing.
				Per cent.	Per cent.	Per cent.	Per cent.
Total Phosphoric Acid......				19.42	19.42	19.42	19.42
Soluble	"	"	....	4.68	4.08	4.65	3.36
Insol.	"	"	40°	7.04	4.46	3.59	5.47
"	"	"	60°	4.15	3.48	3.50	5.08
"	"	"	100°	1.96	3.81	2.86	....
Reverted	"	"	40°	7.70	10.88	11.18	10.09
"	"	"	60°	10.59	11.86	11.27	11.03
"	"	"	100°	12.78	11.53	11.91	....
Available	"	"	40°	12.38	14.96	15.83	13.45
"	"	"	60°	15.27	15.94	15.42	14.39
"	"	"	100°	17.46	15.61	16.56	....
Moisture......................				32.85	29.63	24.07	21.50

TABLE II.

Calculated on dry basis.	At Mixing.	End of 3d week.	End of 4th week.	End of 5th week.	End of 6th week.	End of 7th week.	End of 8th week.	End of 9th week.	End of 10th week.	End of 11th week.	End of 12th week.	End of 13th week.	End of 14th week.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Total Phos. Acid....	21.77	21.77	21.77	21.77	21.77	21.77	21.77	21.77	21.77	21.77	21.77	21.77	21.77
Sol. " "	7.83	6.16	5.40	5.10	5.02	4.17	3.79	3.49	3.10	3.17	3.09	3.04	3.25
Insol. " " 60°	8.46	8.72	9.06	8.71	8.58	8.05	7.24	7.86	8.09	8.18	7.63	7.32	7.66
" " " 100°	..	8.76	8.97	8.34	8.03	7.99	7.34	7.82	7.83	7.57	7.68	7.24	7.60
Rev'd " " 60.	5.48	6.89	7.31	7.96	8.17	9.55	10.74	10.42	10.58	10.42	11.05	11.41	10.86
" " " 100°	..	6.84	7.40	8.33	8.72	9.61	10.64	10.46	10.84	11.03	11.00	11.49	10.91
Avail. " " 60°	13.31	13.05	12.71	13.06	13.19	13.72	14.53	13.91	13.68	13.59	14.14	14.45	14.11
" " " 100°	..	13.00	12.80	13.43	13.74	13.78	14.43	13.95	13.94	14.20	14.09	14.53	14.17
Moisture............	31.49	26.16	30.77	16.14	12.41	8.22	6.01	5.17	5.22	6.86	6.03	5.36	6.10

TABLE III.

Calculated on Dry Basis.	At Mixing.	End of 1st week.	End of 2d week.	End of 3d week.	End of 4th week.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Total Phosphoric Acid.........	20.17	20.17	20.17	20.18	20.17
Soluble " "	14.02	15.42	12.57	12.20	11.60
Insoluble " " 40°.....	1.28	.94	.94	.32	.42
" " " 60°.....	....	.77	.76	.42	....
" " " 100°.....	....	.63	.39	.41	....
Reverted " " 40°.....	4.87	5.81	6.66	7.65	8.15
" " " 60°.....	....	5.96	6.84	7.55	....
" " " 100°.....	....	6.12	7.21	7.56	....
Available " " 40°.....	18.79	19.23	19.24	19.85	19.75
" " " 60°.....	....	19.40	19.41	19.75	....
" " " 100°.....	....	19.54	19.78	19.76	....
Moisture......................	41.61	30.20	30.19	29.29	28.90

The sample yielding about 8 per cent. soluble phosphoric acid was examined through a much longer time than either of the others. For comparison, therefore, we must consider them at the end of the same time, i. e., at the end of the fourth week.   During this time, as indeed throughout the experiment, the samples worked on stood in large earthenware pans in the laboratory and were protected from dust.

Table IV. shows the rate of reversion for 4 weeks, absolute and comparative, and the accompanying loss of moisture :

TABLE IV.

	At Mixing.	4 weeks. after Mixing.	Loss of Soluble.	Reverted p. c. of Original Soluble.	Loss of Moisture in 4 Weeks.	Loss of Moisture p. c. of Original.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Soluble Phosphoric Acid.	4.68	3.36	1.32	28.21	11.35	34.55
" " "	7.83	5.40	2.43	31.03	10.72	34.05
" " "	14.02	11.60	2.42	17.26	12.75	30.61

TABLE V—COMPARE TABLE II.

BEHAVIOR OF INSOL. PHOS. ACID.

+ denotes gain.				— denotes loss.			End of Weeks.				
3	4	5	6	7	8	9	10	11	12	13	14
+ p. c. .26	+ p. c. .60	+ p. c. .25	+ p. c. .12	— p. c. .41	— p. c. 1.22	— p. c. .60	— p. c. .37	— p. c. .28	— p. c. .83	— p. c. 1.14	— p. c. .80

TABLE VI—COMPARE TABLE II.

BEHAVIOR OF SOLUBLE AND REVERTED PHOS. ACID, 60°.

	3d week.	4th week.	5th week.	6th week.	7th week.	8th week.	9th week.	10th week.	11th week.	12th week.	13th week.	14th week.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Loss of Phos. Acid	1.67	2.43	2.73	2.81	3.66	4.04	4.34	4.73	4.66	4.74	4.79	4.58
Gain Revt'd "	1.41	1.83	2.48	2.69	4.07	5.26	4.94	5.10	4.94	5.57	5.93	5.38

The most striking fact brought out by these tables is that the insoluble phosphoric acid is not stationary, but oscillates from week to week. Thus from Table V. it is seen that this oscillation of insoluble phosphoric acid is from a gain of .60 per cent. to a loss 1.22 per cent., the interval between being four weeks.

The oscillation of insoluble phosphoric acid has been touched upon by J. Post, (Chem. Industr. 1882, p. 217), who states, among other most interesting facts, this, that during the first month the

phosphates which have become insoluble in water remain soluble in citrate at 40°; but later on a part of the reverted phosphoric acid insoluble at 40° becomes insoluble in citrate even at 90°. In other words, the per cent. of insoluble phosphoric acid varies from time to time. In reflecting upon this subject, there was reason to suspect that this variation was largely controlled by the mechanical condition of the analytical sample. Some experiments were begun on this point, but could not be carried through, owing to the pressure of routine work. In passing an article of 6 per cent. or 8 per cent. moisture through a 40 mesh sieve, a good deal of it must necessarily be pulverized finer than the sieve. The less moisture the article holds, other things being equal, the more will there be of it much finer than the seive. The citrate acts upon this fine stuff more effectually than upon the coarser, and in this way the variation of the insoluble phosphoric acid may be partially explained. Doubtless this has some effect, for from the 7th through the 14th week, Tables II. and V., when the moisture varied from 8.22 per cent. to 5.17 per cent., there was a loss of insoluble phosphoric acid all the time.

Other interesting points might well be considered did this space allow. Such as they are the careful reader will recognize. It is hoped to follow up this discussion with some parallel observations as soon as possible.

Laboratory of the Navassa Guano Company, }
Wilmington, N. C. }

REVERSION OF PHOSPHORIC ACID BY HEAT, TOGETHER WITH SOME OBSERVATIONS ON THE FINE GRINDING OF ANALYTICAL SAMPLES.

W. B. PHILLIPS, PH. D.

When manufactured phosphates are analyzed immediately after preparation, the percentage of phosphoric acid soluble in water is generally found to be higher than at any subsequent time. A portion of it becomes insoluble in water, but is soluble in some of the organic salts of ammonia; i. e., in the oxalate and citrate. To this phosphoric acid the term *reverted* is applied, signifying, as is well known, phosphoric acid which, though at one time soluble in water, has become insoluble in that liquid, and occupies an intermediate position between the original tri-calcium-phosphate of the crude material, and the tetra-hydrogen-calcium-phosphate of the manufactured product.

The change from soluble to reverted begins almost at the very moment of manufacture, and continues for an indefinite period, varying among other things with the raw material used, the quantity of acid employed, &c., &c.

It might be supposed that as this reversion begins when the product begins to dry, it was connected intimately with the process of drying. But it has been shown by Post (Chem. Industr. 1882, p. 217,) that it goes on even in samples enclosed in hermetically sealed bottles, and hence is not dependent on the loss of moisture, under ordinary conditions of temperature.

The limits of this paper will not allow me to enter at all into the discussion of the various causes of reversion. Among the more prominent ones are the presence of unattacked oxides of calcium, iron, and aluminum, and calcium sulphate and carbonate.

The object of this paper is to direct attention anew to the fact that a temperature of 100° C, maintained for varying lengths of time on the manufactured phosphates, causes a very rapid reversion.

The material used was a sample of an "Acid Phosphate" prepared under my personal supervision at the works of the Navassa Guano Company. It was prepared as follows :

Fine ground Charleston Rock_____1,100 pounds.
Sulphuric Acid, 470 B_____ 950   "

Several tons of it were made November 21st, 1883, and a sample of it was drawn by myself, November 22d. The sample was pulverized by hand as fine as possible, and analyzed at once.

Fifty grains of the sample were then taken and dried at a temperature of 90°–100° C. for two days. At the end of that time a sample was drawn, pulverized until it passed through a sieve of 100 meshes per square inch, and analyzed.

The drying was continued for eight (8) days longer, at the end of which time a sample was drawn, passed through a 100 mesh sieve, and analyzed.

Tabulating these results for convenience of reference we have :

On a Dry Basis.	A	B	C
	24 hours after preparation, pulverized by hand.	After 2 days at 90°–100° c. Through 100 mesh sieve.	After 10 days at 90°–100°c. Through 100 mesh seive.
Total Phosphoric Acid....	17.31 per cent.	17.13 per cent.	17.32 per cent.
Soluble " "	11.74 " "	10.59 " "	7.48 " "
Insoluble " "	3.32 " "	2.95 " "	2.85 " "
Reverted " " ...	2.25 " "	3.59 " "	6.99 " "
Available " "	13.99 " "	14.18 " "	14.47 " "

We have here a loss of 4.26 per cent. of sol. phos. acid in days, a loss of .47 per cent. of insol. phos. acid, and a gain of 4.74 per cent. of reverted. Ordinarily the loss of soluble is compensated by the gain of reverted, while the insoluble remains about the same. Post, in the article before referred to, claims to have found that in the course of six (6) months, in sealed bottles, some of the soluble becomes so insoluble as not to be dissolved by ammonium citrate at 90° C. But here it is shown that in ten (10) days at a temperature of 90—100° C, some of the originally insoluble phosphoric acid, viz: .47 per cent. has *become soluble in ammonium citrate at* 40° *C.*, that is, has changed to reverted ! But this loss of .47 per cent. of insoluble phosphoric acid is doubtless due to the very fine grinding of the dry samples. For the difference in insoluble phosphoric acid between the first and second analyses is .37 per cent., while the difference between the second and third is only .10 per cent. That is to say, the difference between the insoluble phosphoric acid in the sample pulverized by

hand and the sample dried for two (2) days and then passed through a 100 mesh sieve, is .37 per cent. in favor of the finely pulverized. But the difference between the two finely pulverized samples after eight (8) days of drying is only .10 per cent.

That the ammonium citrate should dissolve· more phosphoric acid from the finely ground sample is just what was to be expected. When sufficient sulphuric acid is added to the crude tricalcium phosphate to render *all* of the phosphoric acid soluble in water reversion does not appear to proceed as rapidly as when there is present some of the original undecomposed phosphate. But in this case, when using Charleston rock, it is very difficult to obtain a product which will dry in a reasonable time without the aid of artificial heat, or some carbonate as a dryer. Using artificial heat there is great danger of hastening reversion, and the same is true if some chemical "dryer" is used, to say nothing of the reduction of the content of total phosphoric acid in this latter case.

There is one point to which I wish to direct especial attention, and that is what I conceive to be the *necessity for fine grinding of the analytical sample*. Plants derive their food from the soil in solutions, and in these solutions the food is in a state of almost inconceivable fineness.

In estimating the value by chemical analysis of any plant food, we should, as far as practical, approximate to the degree of fineness to which the food must be reduced before the plant can use it.

Other things being equal, the finer we grind analytical samples before acting upon them with chemical reagents which in a greater or less degree represent the action of the soil the nearer do we approach to the methods of nature.

Laboratory of Navassa Guano Company, }
    Wilmington, N. C., Dec. 6ᵗʰ 1883. }

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Note on the Molecular Volumes of Some Double Chlorides. R. ROMANIS.

The mol. vols. of the anhydrous double Chlorides K_2SnCl_6 and $(NH_4)_2SnCl_6$ are respectively 138.6 and 146.1 and the contraction as compared with the vols. of the constituent chlorides, 38 and 54.5, agreeing very closely with the corresponding platinochlorides. In the case of the chlorides $(NH_4)_2PtCl_4$, $(NH_4)_2ZnCl_4$ and K_2SnCl_4, expansion occurs, the mol. vols. being larger than the sums of the vols. of the constituent chlorides. In K_2SbCl_6 2. H_2O the mol. vol. is 200.8 and the contraction 52.6. (*Chem. News, XLIX.* 273.) A. A. B.

Spectroscopic Examination of Vapors Obtained on Heating Iron and Other Metals at Atmospheric. J. PARRY.

The metals were heated to fusion, and the spark passed through the vapors evolved. Spectra obtained with Fe. Mg. Cu. &c. are described. (*Chem. News, XLIX.* 234.) A. A. B.

Chemical Phenomena of the Respiration of Plants. T. L. PHIPSON.

In a previous paper (*Chem. News XLVIII.* 205.) the author has described experiments upon the respiration of unicellular algae submerged in a solution of CO_2. He now finds that the conclusions then formed apply to unicellular algae in general, and, probably, to all plants except fungi. The evolution of oxygen in spring water is less active after renewal of the supply of CO_2 which has been once exhausted, and spring water boiled with certain precautions and then impregnated with CO_2 does not permit such respiration. The phenomenon of respiration requires presence of H_2O_2 of which spring water contains an abundance ; probably 6 to 8% of the oxygen yielded by boiling it has existed as H_2O_2. The author promises the proof of this conclusion in another paper.

MnO_2 exposed to sunlight in spring water can be made to *breathe* like the unicellular algae.

(*Chem. News, L.* 37.)

A. A. B.

Recent Estimations of the Amount of Salicylic Acid in the Cultivated Pansy. A. B. GRIFFITHS and E. C. CONRAD.

Salicylic acid was first discovered in plants by Piria in 1838 and later (1844) was found by Gerhardt and Cahours in wintergreen (*gaultheria procumbens*). Mandelin finds this acid or acids of the Cn H_2n-_8 O_3 series in the Violaceae generally.

The authors find salicylic acid in the common garden pansy in the following proportions :

Leaves, per cent. - - - -	.1329
Stems " - - - -	.0854
Roots, " - - - -	.0530

The flowers contain only a trace. Microscopic examination fails to discover crystals of the acid in the cells of the plant and its production and function in the plant are still unexplained. (*Chem. News, L* 102.)   A. A. B.

On the Physiology of the Carbohydrates in the Animal System. F. W. PAVY.

An investigation undertaken with the object of ascertaining the changes undergone by the four chief carbo-hydrate elements of food, viz: grape sugar, cane sugar, lactine and starch, during digestion. Beginning with the stomach, the attempt is made to follow the changes in these substances as they proceed towards absorption up to their arrival within the portal system of vessels. The experiments were performed upon the digestive organs of freshly-killed rabbits, portions of the stomach or intestines being left in contact, for a given time, with solutions of known weights of the carbohydrate in question, and the copper-reducing value of the substance, after this digestion, was compared with that which it had been found to have before contact with the animal substance. Inasmuch as grape sugar is characterized by the property of possessing the same reducing power after treating with sulphuric acid as before, while the carbo-hydrates which represent steps in an operation of which glucose is the final product, are altered in reducing power by the action of the acid, the author took the precaution to boil one portion of the modified liquid with sulphuric acid in all cases before estimating the reducing power. The copper-reducing value of the digested liquid may thus be compared with that of glucose, while the relation of the modified product to glu-

cose is also ascertained. The most striking results of these experiments is the indication that transformation of glucose into bodies of lower reducing power is possible under the influence of a ferment existing in the stomach and intestines. Boiling of the animal substance with water previous to the experiment was found to annul the action of this ferment. The latter body seems to exist rather within the walls of the vessels examined than upon the mucous surface. So far as the experiments have gone, the author regards them as indicating that this ferment is more abundant in the stomach and intestines of the rabbit than of those of the dog, cat, horse, sheep or pig. (*Chem. News*, *XLIX.*, 140.) A. A. B.

ORGANIC CHEMISTRY.

Synthesis of Anthrachinoline. C. GRAEBE.

After Skraup had shown that β-naphthylamine on being treated with glycerine, sulphuric acid and nitrobenzole, was converted into β-naphtochinoline, it seemed probable that anthramine, under the same conditions, would yield anthrachinoline. This investigation was undertaken with the view of determining whether, in this case, the same product would be obtained as that derived from alizarine blue by heating it with zinc dust. Previous examination led the author to believe that the anthrachinoline derived from alizarine blue has the following composition :
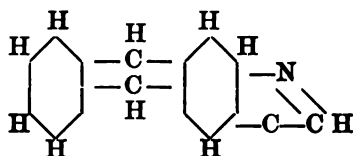
Now, as the amido-group in anthramine was supposed to hold the same position as the nitrogen atom in alizarine blue, it was therefore probable that anthramine would yield the same anthrachinoline. This was fully verified by experiment. An anthramine melting at 170° C is. obtained. It forms yellow colored salts which, in solution, possess a very strong green fluorescence. (*Ber. d. chem. Ges. 1884, 170*.)   J. H. S., JR.

Upon the Action of Phenylhydrazine upon the Imido-ethers. (Azidines.) A. PINNER.

It is known that all primary amines react with the chlorides of imido-ethers in such a manner that symmetrical, di-substituted amidines result therefrom, viz :

$$R.C\begin{matrix}N H\\\\O C_2 H_5\end{matrix} + 2 R'NH_2 = RC\begin{matrix}N R'\\\\N H R'\end{matrix} + 2 C_2H_6O + N H_3$$
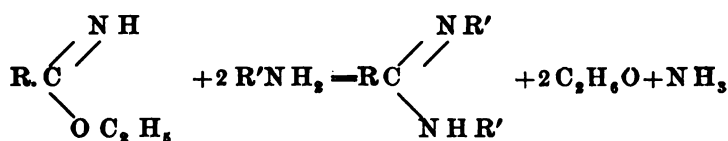
This reaction takes place (as the author has shown) more or less rapidly in two consecutive phases, viz :

$$(I) \quad R.C\begin{matrix}N H\\\\O C_2H_5\end{matrix} + R'N H_2 = R C\begin{matrix}N R'\\\\O C_2 H_5\end{matrix} + N H_3$$
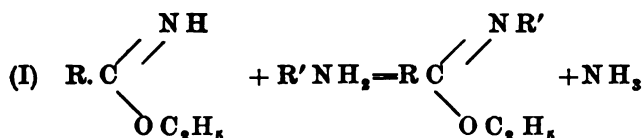
At first the imido-group is exchanged for the remainder of the amine group, and then only is the oxyethyl group replaced by a second, univalent amido-radicals, viz :

$$(II) \quad R.C\begin{matrix}N R'\\\\O C_2H_5\end{matrix} + R'N H_2 = R.C\begin{matrix}N R'\\\\N H R'\end{matrix} + C_2H_5OH$$
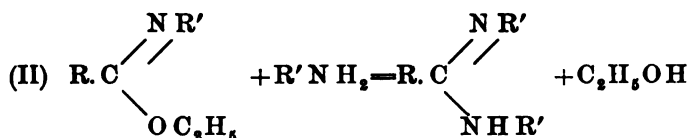
It was therefore to be expected that, with the aid of the hydrazines, analogous reactions would take place. For this reason phenylhydrazine was treated in alcoholic solution with the chloride of benzimido-ether.

The author calls the first class of these compounds "azido-ethers," and the second class "azidines."

In reality the above reactions take place when a solution in absolute alcohol of about 2 mols. phenylhydrazine are added to an alcoholic solution of the imido-ether chloride. (*Ber. d. Chem. Ges. 1884, 182.*)   J. H. S., JR.

Upon the Action of Hydroxylamine upon the Imido-ethers and the Amidines. (Acidoximes.) A. PINNER.

It was found that hydroxylamine united readily with benzimido-ether and benzamidine to form benzoximido-ether

$$C_6H_5C \overset{N\,OH}{\underset{OC_2H_5}{\diagup}} \quad \text{and benzoxamidine, viz:} \quad C_6H_5C \overset{N\,OH}{\underset{NH_2}{\diagup}}$$

(*Ber. d. ch. Ges. 1884, 184.*)

J. H. S., JR.
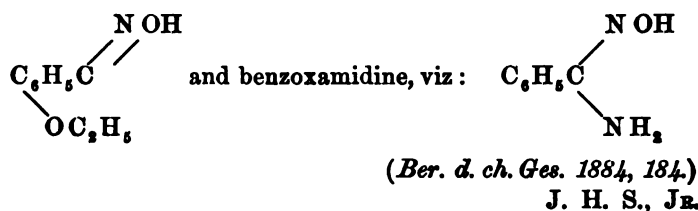
On Paradibromchinoline. SIGMUND METZGER.

The original material in this investigation was benzene, which, at a boiling temperature, was treated with 8 pts. of bromine. Paradi-brombenzole (M. P. 89° C.) was thus obtained. This was converted into the nitro-compound by treating it with hot nitric acid. The mononitroparadibrombenzole was converted into paradibromaniline by reduction. 5 grms. paradibromaniline, 12 grms. nitrobenzole, 60 grms. glycerine and 50 grms. conc. H_2SO_4 were heated to-together for 5 hours. The melt was diluted with water and treated with steam, which carried over a compound which proved to be paradibromchinoline (M. P. 127°–129° C.). (*Ber. d ch. Ges. 1884, 186.*)

J. H. S., JR.

On Parachinoline Sulpho-Acid. JOSEPH HAPP.

The only sulphur acids of chinoline now known are the ortho- and meta-sulpho-acids which have the following structure :

Ortho sulpho-acid.
1:1′
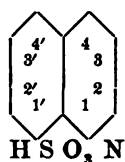
Meta sulpho-acid.
1:4
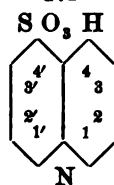
A para sulpho-acid should therefore be produced, if sulphanilic acid were treated with glycerine, nitrobenzole and sulphuric acid.

The para sulpho-acid obtained by the author has the following structure :

$$H_5O_3 \quad \begin{array}{c} 4' \quad 4 \\ 3' \quad 3 \\ 2' \quad 2 \\ 1' \quad 1 \\ N \end{array}$$
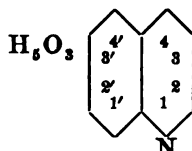
It consists of highly refracting, shining crystals, which are quite stable. It dissolves with difficulty in cold, but more easily in hot water. The aqueous solution reddens litmus paper. It unites easily with bases to forms salts. (*Ber. d. chem. Ges. 1884, 191.*)

J. H. S., JR.

On Derivatives of β-Dinaphtylamine. CH. RIS AND A. WEBER. (Dinitro-β-Dinaphtylamine.)

This was obtained by treating the base, dissolved in glacial acetic acid, with fuming nitric acid. This body crystallizes from cumene in yellow red needles, which melt at 224–225° C.

Tetranitro-β-dinaphthylamine.

This compound is formed at the same time as the previous one and almost exclusively, if nitration is performed without cooling the mixture. Crystallizes from nitrobenzole in little yellow crystals. M. P. 285–286° C. (*Ber. d. chem. Ges 1884, 197.*)

J. H. S., JR.

On Chrysaniline. O. FISHER AND G. THÖRNER.

The authors found that chrysaniline is a diamidophenylacridine, as they were enabled to obtain not only phenylacridine from chrysaniline, but also to produce the latter in a new way, synthetically. The material used in these experiments was Oehler's phosphine, which, after being purified, crystallizes in long, golden yellow needles.

Chrysophenole.

This was obtained from chrysaniline by heating it, under pressure, with 3–4 pts. strong H Cl. The following reactions then take place :

$$C_{19} H_{15} H Cl + H_2 O = C_{19} H_{15} N_2 O + N H_4 Cl,$$
$$\text{or } C_{20} H_{17} N_3 H Cl + H_2 O = C_{20} H_{17} N_2 O + N H_2 Cl.$$
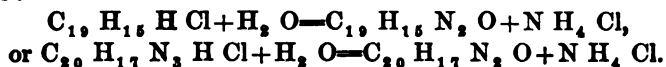
Phenylacridine.

The formation of this compound from chrysaniline is a proof that the latter has the formula $C_{19} H_{15} N_3$. 10 grms. chrysaniline were dissolved in 50 grms. conc. $H_2 S O_4$, the mixture cooled, and then treated with a stream of nitrous acid until an excess of the latter predominates. The diazo-compound thus formed was poured into 600 grms. of boiling absolute alcohol, and, after the evolution of nitrogen has ceased, an intensely yellow green, fluorescing solution was obtained. The alcohol was distilled off, and the acid solution, after being diluted was treated with an alkali which threw down a precipitate consisting of reddish flakes. These were then treated with a current of steam. A substance was thus obtained melting at 181°, which turned out to be phenylacridine. It will therefore be seen that chrysaniline is a diamidophenylacridine.

Synthesis.

E. Renouf, a short time since, found, on treating orthonitrobenz-aldehyde with aniline, that a compound was obtained which he called orthodiparatriamidotriphenylmethane, and that this body, on oxidation with arsenic acid, yielded a brown coloring matter. The authors found, on treating this triamidotriphenylmethane with arsenic acid at 180–200° C, that chrysaniline is formed. (*Ber. d. ch. Ges. 1884, 203.*)   J. H. S., JR.

Chlorophyll Probably a compound of Iron with one of the Glucosides. A. B. GRIFFITHS.

From recent researches of E. Schunck upon chlorophyll (Proc. Roy. Soc. **36**. 183) and from those of the author upon the value of iron, as ferrous sulphate, to plants, (This Journal, vol. VII. 77) the attempt is made to justify the conclusion suggested in the above title. (*Chem. News, XLIX.* 237.)   A. A. B.

The Chlorination of Pyrogallol. C. S. WEBSTER.

The first stage in chlorination of pyrogallol (in solution in glacial acetic acid) is found to be trichlorpyrogallol, $C_6 OCl_3(O H_3)$ which crystallizes in needles with $3H_2 O$. (*Chem. News, XLIX.* 140.)   A. A. B.

ANALYTICAL CHEMISTRY.

On the Estimation of Boracic Acid in Borosilicates. C. BODEWIG.

The estimation of boracid acid as such, or in simple borates, is of no particular difficulty, provided the re-agents, (especially hydrofluoric acid) are pure. The estimation becomes much more difficult in the presence of Si O_2.

In order to separate both acids, the mineral is fused with 4 times its weight of a carbonate, then extracted, first with water, afterwards with water to which a little ammonium carbonate has been added. It may then be washed, and the Si O_2 precipitated, by the addition of ammonium sesquicarbonate, or auminic chloride. The ammonium sesquicarbonate is added in portions of 2½ pts., until the carbonates are converted into bicarbonates. The ammonium carbonate thus obtained, is mostly expelled by heating on a water-bath, and the Si O_2, washed with water. By this means a certain amount of Si O_2 remains dissolved in the alkaline fluid, which, after expelling all the ammonium carbonate, may be precipitated, by adding zinc oxide, dissolved in ammonia. (Of course the ammonia must first be driven off by evaporation.)

(Fres. Zeit. 1884. 113.)

J. H. S., JR.

On the Quantitative Estimation of Quartz in Rocks and Clays. J. HAZARD.

The method depends upon the decomposition of silicates on being treated with dilute sulphuric acid, under high pressure.

(Fres. Zeit. 1884. 158.)

J. H. S., JR.

On the Estimation of Nitric Acid, in the Presence of Other Acids, which mask its Reactions. ANTONIO LONGI.

The estimation of nitrates in the presence of iodides, bromides, chlorates, bromates, etc., is not only difficult, but at times apt to produce grave errors. The author has now found a method, which depends upon the reduction of the oxygen acids, and the elimination of bromine, but more especially of iodine. The reduction of the oxygen acids, is effected with SO$_2$. The bromine and iodine

are eliminated by G. Vortmann's reaction. In solutions containing
besides the oxygen acids above mentioned, also ammonium salts, a
part of the N H_3 becomes oxidized to nitric acid. In such cases,
reduction must take place in the cold.

The solution to be examined, if acid, is first neutralized with
Na_2CO_3, and then treated with SO_2, until it smells strongly of the
latter. When reduction is complete, the solution is heated to ex-
pel excess of SO_2. Then add Na_2CO_3 to slight alkaline re-
action and heat to boiling, until chromium, and the other heavy
metals, have been precipitated. Filter, if a precipitate is formed,
and acidify with acetic acid, to the solution now add a little acetic
acid and lead peroxide, and boil till further addition of $HC_2H_3O_2$
and lead peroxide produces no fumes which color starch paper. The
solution is then allowed to cool and filtered to separate the excess of
lead peroxide. Any lead in solution is precipitated with sodium
sulphate, and filtered. The filtrate is evaporated to dryness, the
residue is dissolved in water, filtered if necessary, and then tested
for nitric acid, with the usual reagents.

(*Fres. Zeit. 1884. 149.*)

J. H. S., JR.

On a Simple Quantitative Method of Estimating Nitric Acid. E. WILDT & A. SCHEIBE.

This method is a modification of Schloesing's process, *i.e.*, reduc-
tion of the nitric acid, to nitric oxide, which is collected in a glass
bell jar, and afterwards oxidized back to nitric acid by adding
oxygen. The author uses an apparatus of peculiar construction.

The liquid to be examined is first heated to drive off air and after
15 or 20 minutes boiling a solution of ferrous chloride is run in-
to the flask. After a few minutes the contents of the flask will
turn brown, indicating reduction. The liquid is now heated to
gentle boiling, and the nitric oxide generated, is freed from H Cl
by passing through a flask containing KOH. It then passes into a
receiver, or gas holder, where it is oxidized back to nitric acid by
the action of the oxygen of the air, and steam. The HNO_3, is then
estimated in the usual way by titration.

(*Fres. Zeit. 1844. 151.*)

J. H. S., JR.

Estimation of Phosphoric Acid.

A report of the sub-committee of the Chemical Trade Section of the London Chamber of Commerce gives the following results of analyses of a sample of Charleston phosphate submitted to five different analysts:

| Phosphoric acid | 26.55 | 26.20 | 26.48 | 26.60 | 26.00 |
| Equal to phosph. lime | 57.56 | 57.19 | 57.82 | 58.06 | 56.75 |

Four of the results were obtained by the magnesium method, the fifth is a mean of two determinations, one by the magnesium, one by the molybdate method. The report recommends that samples, finely ground by the manufacturer, shall be furnished for analysis and additional samples of the same, coarsely crushed, for determination of water, and that in case of a difference of more than 1½% of calcium phosphate in commercial analyses made by two different chemists, the results shall be submitted to both of them for their opinion as to the cause of difference. The report is signed by five members. (*Chem. News, XLIX*. 230.)   A. A. B.

On the Estimation of Phosphoric Acid in Fertilizers. D. Lindo.

A comparison of the oxalic and molybdate methods. The difficulty of removing silica entirely introduces an error which is greater in the oxalic method, but not entirely absent in the molybdate method. Presence of Al and Fe cause precipitation of SiO_2. Aluminium silicate is soluble to a small extent in ammonium citrate, but not in presence of magnesia mixture. In the oxalic method a trace of lime is dissolved from the oxalate by oxalic acid. Reprecipitations after solution in acetic acid, as generally recommended, may be avoided, however, by adding an excess (1.5 to 2 grms.) of citric acid at the proper stage of the process and filtering after 3 to 4 hours with sufficient excess of Mg. mixture. $P_2 O_5$ in presence of ammonium citrate and oxalic acid is precipitated as fully in two hours as in ten. (*Chem. News XLIX*. 247.) A. A. B.

On the Qualitative Examination, and the Quantitative Estimation of As, S, P, and Other Metals in Native Copper. O. Kuhn.

(*Fres. Zeit. 1884. 165.*)

J. H. S., Jr.

Estimation of Manganese in Cast Iron and Spiegel. C. L. BLOXAM.

The method, which is particularly adapted to estimation of small quantities of iron, depends upon precipitation of iron as phosphate in presence of acetic acid. This precipitate is then dissolved in H Cl, evaporated to separate Si O_2, and oxidized with K ClO_3 ; excess of acetic acid is added, then ammonia and excess of Na_2 H PO_4. The precipitate is filtered out, redissolved and again thrown down with acetic acid and ammonia ; the combined filtrates are boiled to expel NH_3, and now precipitated as crystalline phosphate. The wet filter and precipitate are at once ignited over a Bunsen lamp. Results good.

(*Chem. News L.* 112.)

A. A. B.

Notes on the Volumetric Estimation of Iron. R. W. ATKINSON.

An attempt to account for discrepancies in commercial analyses of iron ores made by different chemists. A series of results is tabulated, showing the errors which arise in standardizing a bichromate solution, when iron or steel of known composition is dissolved in sulphuric acid and titrated directly. The results of this method, which, according to the author, is in very general use, do not agree with those obtained by standardizing with ammonioferrous sulphate, nor by solutions of the same steel in nitric acid and subsequent reduction of the iron after evaporation with HCl ; the last two methods, however, give concordant results. The difficulty is ascribed to the action of hydrocarbons, produced during solution, upon the solution of dichromate. The results of analyses in the latter case (direct titration) are too low. (*Chem. News*, *XLIX.*, 117.)

A. A. B.

On the use of Rosolic Acid, Methyl Orange, Phenacetoline and Phenol-Phthalein, as Indicators. Part III. R. T. THOMSON.

A continuation of previous papers. The determination of alkaline hydrates in presence of large proportions of carbonates is accomplished by an improved process depending on the insensibility of phenolphthalein to precipitated barium carbonate. A solution of

barium chloride, neutral to phenolphthalein, and of known strength, is added to the alkaline solution and the hydrate present is titrated directly *in the cold*, the latter point being of the utmost importance. Calcium chloride cannot replace the barium salt in this process. Directions are also given for estimation of hydrates in presence of normal sulphates and phosphates of the alkaline metals, for the estimation of bicarbonates in presence of normal carbonates, and for the estimation of alkaline arsenates and arsenites. (*Chem. News, XLIX.*, 119.)   A. A. B.

Researches on Spectrum Photography in Relation to New Methods of Quantitative Chemical Analysis. Part II. W. N. HARTLEY.

An abstract of a paper read before the Royal Society. An account is given of the lengths and strength of metallic lines in solutions of definite strength. The sensitiveness of the spectrum reaction obtained by the writer is almost incredible. $\frac{1}{1000000}$ mg. is easily detected, and the delicacy of the reaction is practically unlimited. The spectra of the more strongly basic element exhibits the most persistent lines. Examples are given to show the application of the tables and other data presented, to quantitative work. (*Chem. News, XLIX.*, 128.)   A. A. B.

Examination of some Musts of 1883, for Acids and Sugar. WM. SCHÄFER.

The acid was estimated with $\frac{1}{10}$ normal caustic soda solution, using litmus as indicator, and calculating the result as tartaric acid.

The sugar was estimated with Fehling's solution. For this purpose the must was heated to 80° C, and filtered, and then treated with Fehling's solution.

(*Fres. Zeit. 1884. 172.*)

J. H. S., JR.

INDUSTRIAL CHEMISTRY.

Superphosphates and Superphosphates. F. J. LLOYD.

The author criticises the results obtained in the agricultural experiments of T. Jamieson carried on for several years in Aberdeenshire and Sussex, England. The analyses of superphosphates used by Jamieson show so large an excess of free sulphuric acid that conclusions against the use of superphosphates in general are not warranted by the results of these experiments. (*Chem. News, XLIX*, 229.) A. A. B.

Notes on a Recent Discovery of a Paraffine Shale Deposit in Servia. A. B. GRIFFITHS. (*Chem. News, XLIX.*, 107.)
A. A. B.

On a New Form of Gas Assay Furnace. W. L. BROWN.

Not intelligible without the accompanying cut. (*Chem. News, XLIX.*, 108.) A. A. B.

Notes on the Concentration of Sulphuric Acid. BY PETER HART.

An historical review of methods. Early in this century glass retorts were set in a sand bath, boiled to concentration, allowed to cool, and "*removed in their arms by men* wearing sheepskin aprons," emptied and refilled, to go through the same course. Platinum came very slowly into use. Tennants & Co., of Glasgow, had a platinum retort in use from 1852 to 1864, when it was replaced by the large glass retorts now used. Gossage in 1857 experimented with a tower filled with flints and heated by furnace gases, the forerunner of the present Glover's tower, but it was not successful. Constant-flow systems with glass, earthenware or platinum have not been a success. Concentration *in vacuo* at 300° F. has been proposed. The latest and most remarkable proposal is concentration in *cast iron*. Iron is not attacked by boiling, concentrated acid, and may be used for the later stages of concentration if the acid be saturated with ferrous sulphate, of which it retains only a trace at 66° B. Acid is introduced at 60° B. into a

retort containing a large quantity of hot acid at 66° B., at such a rate that the density of the mixture does not pass below 65° B. This property of sulphuric acid has long been known and is largely applied in the "parting" process for gold alloys. It is remarkable that it should have remained so long without being utilized. (*J. Soc. Ch. Ind. III.*, 6,355.)   A. A. B.

On the Quantuative Estimation of Oils and Fats. (Part II.)   E. J. MILLS and T. AKITT.

Dissolves the oil in CS_2 or CCl_4, preferably the latter, and titrate with Br in solution in the same solvent. Tetrochloride solution of Br is stable for at least twelve weeks. The oil should be as nearly as possible free from water, as the latter increases absorption of Br. 0.5 grm. of the oil is taken, dissolved in 50 c.c.CCl_4. Standard Br is added until a permanent coloration (remaining 15 minutes) is produced. β Naphthol is used to titrate back excess of Br. It forms a monobromo-derivitive in presence of CCl_4. Average probable error is 0.62%, or, with β naphthol 0.46%. Mean strength of standard Br solution, .00644 c.c. grm. per c.c. (*J. Soc. Ch. Ind. III.*, 6,367.)

A. A. B.

Abstracts of Patents Relating to Chemistry.

(*From the Official Gazette of the U. S. Patent Office.*)

May 6th, 1884.

297,971.—Manufacture of artificial stone and marble.—H. A. Daniels.

A mixture of incompatible substances.

297,988.—Apparatus for manufacturing illuminating gas.—A. O. Granger.

A body of coal in a furnace is heated by a blast of air, and the resulting products are burned in a fixing chamber, whereby it is heated. Steam is then decomposed by passage through the heated coal, forming carbonic oxide and hydrogen, which are stored in a holder. They are thence passed to and carbureted in a separate auxiliary hydrocarbon-vaporizer, and the carbureted gas is fixed by passing it through the said heated fixing chamber.

298,026.—Method of manufacturing artificial stone.—M. B. Randle and B. E. Turner.

A partially hardened mass of cement, sand and lime, is subjected to a rubbing operation of cement, lime and water for filling the pores, etc. The stone is finally saturated with lime water.

298,057.—Gas generator and 298,058 Carbureter.—L. C. Beebe.

Hydrogen is evolved from aciduated water and iron scraps, and passed through gasoline or other hydrocarbon.

298,072.—Insulating material.—D. H. Dorsett.

Composed of coal tar, paraffine, silicious sand, and pulverized coal ashes and cinders, black oxide of manganese, and ammonium chloride.

298,101.—Process for the purification of water.—A. R. Leeds.

The water is saturated with oxygen or ozone, by causing it to come in contact, while under artificial pressure and in motion, with compressed air in a system of pipes and air chambers, permitting both air and water to enter under pressure, to move through said system while under pressure, and to be discharged into a suitable reservoir.

298,149.—Process of dissolving metals in ammoniacal solutions.—C. R. A. Wright.

Consists in subjecting fragments of copper, etc., to the action of water, ammonia and a stream of air.

298,165.—Apparatus for extracting cane juice.—G. B. Boomer. Improvement on patent No. 269,628 to same inventor.

The cane is cut into short lengths and submitted to the fumes of burning sulphur, then steamed in a closed tank and finally pressed.

298,175.—Galvanic battery.—C. L. Clarke.

A galvanic cell having an oxide of mercury as the depolarizing agent, and a solution of potassic or sodic hydrate as the exiting fluid.

298,256.— Process of obtaining soda.—J. Townsend.

Kainit is mixed with silica or silica and alūmina, the mixture heated and air or steam passed through it, whereby chlorine or hydrochloric acid is evolved. Carbonacious material is mixed with the residue to reduce the sulphates into sulphides. The solutions resulting from the lixiviation of the latter are treated with carbonic acid to form carbonates.

298,281.—Asbestus compound and articles made therefrom.—C. F. Brigham.

Asbestus and magnesia paper pulp incorporated and made plastic to be molded.

298,282.—Fire and waterproof material for roofing.—C. F. Brigham.

Asbestus board or paper treated with silicate of soda and with chloride of calcium.

May 13th, 1884.

298,365.—Metallic alloy for safes.--J. Farrel.

Tin plate scrap, iron and franklinite iron.

298,366.—Rendering goods and fabrics water-proof.—R. S. Forbes.

The goods are soaked in a waterproofing solution composed of vegetable or mineral wax or paraffine dissolved in a light hydrocarbon, dried, steamed, subjected to the action of sulphuric acid, and then washed and neutralized by means of an alkaline solution.

298,426.—Furnace for the manufacture of metals direct from the ore.—J. A. Stearns.

298,462.—Apparatus for generating and carbureting hydrogen gas.—L. S. Groves.

Hydrogen is evolved from iron clippings and carbureted by passing through gasoline.

298,617 and 618.—Method and process of treating cotton seed.—J. F. O'Shaughnessy.

Relates to mechanical processes for separating the fiber from the pulverized hulls.

298,640.—Separating liquid from solid matter and mechanism therefor.—H. Warden.

A filtering press in which successive charges of the liquid are subjected to filtration and pressure.

298,663.—Process and apparatus for extracting gold and silver from their ores.—C. P. Bonnett.

An amalgamation process with electrified mercury.

298,669.—Retort for ammonia ice-making apparatus.—M. S. Conly.

A series of pipes and partitions whereby aqua ammonia is caused to flow in one direction through the retort, and hot water is caused to flow in the other direction, thus subjecting the aqua ammonia to a constantly increasing heat.

298,712.—Apparatus for reducing. refining and separating hydrocarbon oils.—E. W. Strain.

298,734.—Apparatus for reducing sulphur.—F. Dickert.

A vertical cylinder furnished with strainers and surrounded by a steam jacket.

298,758.—Filter press.—S. H. Johnson.

Suitable projections upon the drainage surface of the press plates cause the one to support the other.

298,816.—Separating the oil from the earth used in refining oils or fats.—M. A. Beal.

Consists in subjecting the fat-saturated earth to boiling in a relatively large body of water and then removing the fat from the surface of the water.

298,941.—Paint.—L. Brown.

Sublimated zinc powder and whiting or other suitable coloring matter and a vehicle.

298,983.—Process of purifying molten iron and steel.—H. Keeler.

Consists in combining them while in a molten state with a mixture formed of pure copper filings and pulverized resin.

298,997.—Electric battery.—O. Millard.

Employs a mixture of lumps of carbon and lead chromate as an electrolyte in connection with an alkaline solution.

298,998.—Obtaining brown dyes from the aromatic diamines.—P. Monnet.

Consists in saturating the material in a bath composed of chlorhydrate of paraphenylene-diamine, or its specified equivalent, sulphuric acid, and water, then wringing, and then treating the material in an oxydizing-bath for developing the color.

299,088.—Composition of matter to be used as a fire and water protective paint.—F. L. Putt and J. B. Stratton.

Coal-gas tar, chloride of sodium, Wisconsin mineral paint, Venetian red, sulphur, resin, asphaltum and other substances too numerous to mention.

299,167.—Process of bleaching, deodorizing, and sweetening benzine. J. Rowsell.

The petroleum benzine is subjected to successive applications of sulphuric acid, alkali, solution of saltpetre and sulphuric acid, solution of sugar of lead and blue copperas, and finally to the chromates or bichromates of potassium sodium or ammonium.

299,198.—Percolator. C. K. Bradford and J. G. Benedict.

A drug percolator, consisting of a vessel provided with a detachable cover in combination with an air-forcing device.

299,824.—Process of purifying or refining petroleum and other distillable oils. R. Baynes and J. Fearenside, Jr.

Consists in adding to the oil, pulverized dry coke or charcoal impregnated with anhydrous chloride of zinc, until it arrives at the consistency of mud, subjecting it to distillation and then condensing the distillate.

299,337.—Apparatus for washing phosphate rock, ores, etc.   F. Brotherhood.

Relates to mechanical arrangements for attaining this object.

299,351.—Compound for cleaning paint.   A. S. Cluff.

For cleaning painted surfaces of wood, iron, etc.,consisting of lime, borax, sal soda, sapolio, Georgia clay, whiting, ammonia, oil of vitriol, and water.

299,372.—Composition of matter for giving a metallic surface to paper.   J. Fransecky.

Argentine, vermillion, silver bronze, glue and water.

299,385.—Process of and apparatus for producing heating gas.   H. Haug.

From carbonaceous material and steam or carbonic acid, or mixture of both. Not intelligible without the specification and drawing.

299,388.—Apparatus for the manufacture of nitrocellulose.   J. W. Hyatt, F. V. Pool, J. Everding, J. H. Stevens, and W. H. Wood.

Consists of settling tanks, storage tanks, fresh acid tanks, weighing or measuring tanks, temperature regulating pots, converting pots, centrifugal machine, etc.

June 2d, 1884.

299,589.—Gas purifier and method of revivifying iron sponge.   O. H. Shiras.

Iron sponge used for purifying gas, after having become fouled, is reoxidized and revivified in the purifying box by means of a current of steam and air blown through it.

299,611.—Process of refining petroleum.   L. A. Baker.

Separate crude petroleum into its light and heavy constituents by mixing with snow and filtering off the lighter constituent from the cooled mixture.

299,704.—Dressing compound for threads, yarns, etc.   J. S. Wattles.

Composed of starch, flour, grease, spirits of turpentine, or its equivalent, alum water, and paraffine wax.

299,774.—Washing and purifying salt.   S. S. Garrigues.

Place the salt in storage bins having perforated bottoms and allow a saturated solution of pure salt to percolate through it.

299,810.—Manufacture of artificial stone.   B. Lande.

Cement, and pulverized iron slag.

299,880.—Process of obtaining hydrochloric acid from the residues of ammonia soda manufacture.   L. Mond.

Produces hydrochloric acid from these residues containing chloride of ammonium and chloride of sodium, by evaporating them, whereby the chloride of sodium salts act, and treats the remaining product with sulphuric acid.

299,857.—Preparation of collodion. E. Schering.
Not intelligible without the specification.

299,860.—Paraffine freezer. W. C. Scofield.
A hollow disc provided with pipes to supply cooling liquid to the chamber
in the disc, and provided with suitable means for sprinkling liquid paraffine
on the disc and automaticlly removing it when frozen.

299,900.—Manufacture of glucose. L. Barbier.
Applies the carbonation process or treatment with carbonic acid to the im-
pure syrups obtained by the direct saccharification under pressure of the amy-
laceous or other materials previously cooked, disintegrated and diluted.

299,919.—Gas generator. P. English.

June 10th, 1884.

300,008.—Carbonic acid gas generator. L. W. Puffer.
For the manufacture of mineral waters.

300,018.—Gasometer for washing carbonic acid gas. R. F. Scannell.

300,023.—Antifriction composition. W. W. Smalley.
Graphite, shellac and gum copal.

300,027.—Apparatus for preparing oxygenated air. A. Stamm.
The combination with an air compresser of two strong closed tanks which
are filled with liquids that absorb oxygen in comparatively larger proportion
than nitrogen, preferably with water having a layer of oil or glycerine (?) on
top.

300,035.—Process of and apparatus for electro-depositing copper, brass,
etc. W. H. Walenn.
The solution consists of cyanide of potassium and neutral tartrate of ammo-
nium, charged by electrolysis with the metal or alloy to be deposited and per-
fected by the addition of cupric ammonide.
The process of electro-depositing metals and alloys by subjecting them to
the action of an electro-depositing solution in a closed vessel under a pressure
exceeding that of the atmosphere at a temperature of from 190° Fahr. up to
the boiling point of the solution.

300,133.—Process of and apparatus for producing cold. J. C. Rossé.
Consists in applying to a liquid a chemical that will produce cold while
going into solution therein, using the cold solution thus formed to cool a fresh
body of liquid, then dissolving a cooling agent in, and thus further reducing
the temperature of the second body of liquid.

300,176.—Galvanic element. W. Wenzel.
The negative electrode, zinc, is contained in a dialyzing cell and immersed
in an alkaline solution, in combination with a positive electrode of platinum
or carbon immersed in nitric acid of 30° to 40° Beaumé contained in a
second porous cell, and a conducting liquid, sulphuric acid of from 50° to 70°
Bé. to electrically connect the electrodes through the medium of the constant
osmotic exchange between the sulphuric and the nitric acid.

800,190.—Fire extingushing compound. N. G. Bartlett.

A fire extinguishing grenade hermetically sealed containing free carbonic acid gas, together with the alkaline chlorides, and an alkaline chloride in solution therein.

800,251.—Explosive compound. W. R. Quinan.

A low-explosive powder composed of a small proportion of nitroglycerine, carbonaceous material, either pulverized or in the form of non-porous small masses or grains, and an explosive salt in the form of non-porous untriturated small masses, grains or crystals.

800,324.—Alloy for coating metals. C. E. Manby.

Lead from sixty to eighty per cent.; zinc from ten to fifteen per cent.; tin from fifteen to twenty per cent., and nickel from six one-hundredths of one per cent. to one per cent.

800,880.—Process of and apparatus for manufacturing gas. J. L. Stewart.

Consists in producing water gas by the decomposition of steam in contact with heated carbon, drawing such gas while hot directly into a vaporizing and mixing conduit by means of a jet of oil under pressure, and thereby forcing the gas into the vaporizer and carbureting it, and then combining and fixing the mixture in heated retorts.

800,881.—Process of and apparatus for manufacturing gas. J. L. Stewart.

Consists in raising a body of fuel to incandescence by combustion thereof with air and decomposing steam in contact with the incandescent fuel by intermittent operations, and periodically raising and breaking up the body of fuel by sudden puffs or blasts of a gaseous or uniform fluid under high pressure greater than the ordinary air blast.

<div align="right">O. H. K.</div>

THE COMPOSITION AND METHODS OF ANALYSIS OF HUMAN MILK.

By Prof. Albert R. Leeds, Ph.D.

In a previous paper, "On Infant Foods," which I read before the College of Physicians of Philadelphia, May 2, 1882, I alluded briefly to the investigation then in progress upon the Composition of Human Milk, and gave a tabular statement of the minimum, maximum, and average results of the analyses of 43 samples, the total number of analyses which I had made up to that date. Since then I have analyzed 37 more samples, and have verified the results by a critical examination of the various methods of analysis, which are in use at the present time.

In the beginning of my previous paper, I asked the question, "What is human milk?" and stated that to answer this question satisfactorily, we should know at least three things: 1st. All the constituents; 2d. Their relative proportion: 3d. Their chemical and physiological properties. It is not my present object to discuss the first and third points, except in the light of the following isolated results which were only incidental to the main object of the present inquiry.

The albuminoids and fat of a large number of samples, as obtained by precipitation with Ritthausen's solution, were extracted with ether, until the albuminate of copper ceased to give up any further traces of fat to the solvent. It then became after drying a very light green amorphous powder.

In order to separate the albuminoids, this powder was digested with very dilute hydrochloric acid, which carries some of the organic matter into solution along with the copper. The residue, after washing and drying at 100°, formed brownish, somewhat brittle, amorphous masses.

The percentage of cupric oxide contained in this albuminate of copper was found in two analyses to be 20.93 per cent., and 20.63 per cent. The ultimate analyses of the albuminate, after deducting cupric oxide, yielded the following results :—

	I. Per cent.	II. Per cent.
Carbon	49.07	49.17
Hydrogen	7.15	7.22
Nitrogen	14.67	....
Sulphur	1.08	1.15

Two analyses of the total albuminoids, left behind after the foregoing treatment of the albuminate of copper with dilute hydrochloric acid, gave the following figures :—

	I. Per cent.	II. Per cent.
Carbon	52.39	....
Hydrogen	7.02	....
Nitrogen	13.64	13.50
Sulphur	1.49	....

The albuminoids, separated by hydrochloric acid from the copper albuminate, were digested with 50 per cent. alcohol, at the boiling point. On cooling, the filtered solution deposited a white flocculent, voluminous precipitate, whilst the residue on the filter formed a somewhat brownish mass.

This precipitate would correspond to the "caseo-protalbin" of Danilewsky (*Jahresb. der Thierch. 1880, 186*), and the residue, which was much the larger in amount, to his "caseo-albumen."

An analysis of the caseo-protalbin gave :—

	Per cent.
Carbon	55.86
Hydrogen	6.07
Nitrogen	17.17

An analysis of the "caseine," obtained by Makris in quite a different manner from Woman's Milk, yielded for its composition, Carbon 52.35 per cent.; Hydrogen 7.27 per cent.; and Nitrogen 14.65 per cent.

The foregoing analyses render evident that the bodies examined are not homogeneous, and in every case the process of separation left behind mixtures of substances the true nature and composition of which are at present unknown. Moreover, the deportment and properties of the bodies examined are such as to lead one to the conclusion that the investigation was being conducted, not upon bodies in the condition and with the properties which they possessed originally in woman's milk, but upon substances whose composition and properties had been altered by the operation of the reagents employed.

It had been the intention of the author to endeavor to isolate the various constituents, at present very imperfectly known, of the fat of human milk. This desire had been increased by the fact that the ethereal extract of the copper albuminate, obtained from numerous samples, although not by any means from all, was colored emerald-green by some copper salt. As to the chemical nature of this copper salt, going as it does in perfect solution in ether, I have no knowledge. Unfortunately, the entire mass of fats was lost by accident in the early stages of manipulation, and I shall have considerable difficulty in again procuring sufficient material to work upon. No sample of cow's milk which I have analyzed yielded to ether an emerald-colored solution. The unknown body is peculiar to woman's milk.

METHODS OF ANALYSIS.

Passing by the methods of analysis which were employed when the nature of the difficulties to be overcome was imperfectly understood, and omitting from discussion in this paper the earliest results as obtained by Meggenhofen, Payen, Henri and Chevallier, L'Héritier. Quevenne, Simon Clemm, Sherer, Donné, Heilen, Regnault and Lehmann, the first method claiming our attention is that made use of by Vernois and Becquerel, in their essay "Du Lait chez la Femme," Paris, 1853.

Although regarded by the authors of the process as the smallest which they could employ, the amount of milk regarded by V. and B. as necessary for analysis is excessive, being 60 grammes.

Total Solids.—Of this, 30 grms. are taken for determination of total solids, which are found by evaporation to constant weight at 80° C. It is evident that the evaporation of so large an amount at so low a temperature not only requires very many hours, but presents great difficulties in the way of expelling the last traces of moisture.

Fat.—The total solids are exhausted on a filter with ether. The loss in weight is set down as fat. Or the ethereal extract after evaporation gives the weight of fat directly.

The estimation of fat by loss of weight involves numerous sources of error. And even the direct estimation according to this method is erroneous, inasmuch as ether very partially exhausts a dried residue of this nature. Consequently, the figures obtained by V. and

B. for fat are much too low, the average in 89 samples being only 2.67 per cent.

The other 30 grms. are coagulated by boiling with some drops of acetic acid. The filtrate contains sugar, extractive matters, and soluble salts.

Milk Sugar.—Its determination by the saccharimeter, as performed by V. and B., gives less accurate results than those obtained by direct chemical methods.

Albuminoids.—The authors regard the nature of the extractive matters as so entirely unknown as to make their determination by analysis impossible, and set down under one head what they denominate " caseum and extractive matters." Its amount is found by subtracting the sum of the weights of fat, sugar, and ash from the total solids. If it were possible by their method to determine these four quantities correctly, the difference, which they style caseum united with extractive matters, would be the albuminoids. But, otherwise, the difference represents the algebraic sum of the errors committed in the various determinations, and this difference, in ▪the present instance, the amount of fat and sugar as stated by V. and B. being much too low, is correspondingly too high, being 3.92 per cent.

Analysis by the same method as that usually employed for Cow's Milk.—This method, which is practiced by some of the public analysts of New Jersey and New York, and which is a somewhat modified form of Wanklyn's, will be found stated in Cairns's Quantitative Analysis, p. 204.

The results obtained on sample of woman's milk, Laboratory No. 1138, were as follows :—

	Per cent.
Ash	0.21
Fat	2.62
Albuminoids	2.60
Milk sugar	8.19
Total solids by summation	13.62
Total solids by evaporation	13.63

The fat, as thus determined, is too low, although it was extracted by digesting the solids left after evaporation with boiling ether six times, and with cold ether as many times more.

The sugar is too high. After weighing it was re-dissolved in water, and the amount of albuminoids contained in it determined. This was 0.78 per cent., which, subtracted from the sugar, as determined in accordance with the method, left 7.41 per cent., which is the correct result.

The albuminoids are also too high, and the excess is still greater when the albuminoids contained in the sugar are added to those as determined in accordance with the method, the total being 3.38 per cent. This excess is due to fat.

Correcting the results, as found directly by the method, by the results obtained by separately analyzing the various educts, we have :

	Per cent.	Per cent.
Fat, determined by method	2.62	
Fat, extracted from casein residue	2.18	
Actual fat		4.80
Albuminoids, determined by method	2.60	
Albuminoids, contained in sugar	0.78	
Sum of albuminoids	3.38	
Deduct fat found in caseine residue	2.18	
Actual albuminoids		1.20
Sugar, determined by method	8.19	
Deduct albumiuoid found in sugar	0.78	
Actual sugar		7.41
Ash		0.21
Total solids, by summation		13.62
Total solids, by direct evaporation		13.68

Determination of the Albuminoids by Precipitation with Acohol.[1] —20 c.c. of dilute acetic acid are added to weak acid reaction, then four volumes of strong alcohol, the mixture well stirred, allowed to settle during an hour, and filtered upon a weighed filter. The precipitate is washed six or eight times with cold sixty per cent. alcohol, then with ether, dried at 120–125° C. and weighed. The alcoholic filtrate is evaporated to small volume, the resultant precipitate transferred by means of sixty per cent. alcohol to a weighed filter, washed repeatedly with the same alcohol, and finally with ether. These filtrates are again evaporated to a small volume, the precipitate obtained dissolved in water, an aqueous solution of tannic acid added, the precipitate so obtained transferred

[1] Handb. der Physiol, Chem. Anal. p. 402. Hoppe-Seyler.

to a weighed filter, washed first with water, then with alcohol and ether, dried at 120° and weighed. The three precipitates together contain all the albuminoids. They must be ignited, and the amounts

[1] Handb. der Physiolog. Chem. Anal. Berlin, 1883, p. 491. Hoppe-Seyler.

of ash deducted. This method gives too low results when the addition of tannic acid is omitted. The trial of this method, as performed on sample, Laboratory No. 1,133, yielded the following results :

                                                            Per cent.
Albuminoids in first precipitate 0.66
      "   " second precipitate....................... 0.55
      "   " third   " 0.42
                                                            ———
        Total albuminoids so determined.................... 1.63

The analysis of these albuminoids yielded :
                                                            Per cent.
Fat.. 0.00
Milk-sugar 0.43

Deducting this amount of milk-sugar, we have :
                                                            Per cent.
Total albuminoids as found................................. 1.63
Deducting milk-sugar 0.43
                                                            ———
Albuminoids actually present.............................. 1.20

Distilling off the alcohol and ether from the first and second precipitates and determining the milk-sugar in the collected filtrates from the albuminoids, I obtained :
                                                            Per cent.
Fat 4.80
Milk-sugar 6.93

These results make it evident, what, indeed, was feared during the whole course of the analysis by this method, that notwithstanding the great expenditure of time in washing these precipitates, the washing was incomplete, and some milk-sugar was left behind. This supposition is confirmed by the fact that, upon adding the milk-sugar contained in the albuminoid precipitates to that contained in the filtrates, the sum is the correct percentage of sugar.

Determination of the Albumen and Peptone by Precipitation with Magnesium Sulphate.[1]—The assumption upon which this method is founded is that when crystallized magnesium sulphate is added to milk to the point of complete saturation, the caseine is

completely precipitated, whilst the albumen and peptone are not. In the execution of the method, 40 c. c. of a saturated solution of magnesium sulphate are added to 10 grms. of milk, and afterwards crystals of the same salt are added in slight excess of the maximum quantity which can be made to enter into solution. After standing several hours with frequent stirring, the precipitate is transferred to a beaker and washed six or eight times with a saturated solution of magnesium sulphate. The collected filtrates are then diluted with water, a drop or two of acetic acid added, heated to boiling for a few minutes, filtered through a weighed filter, the precipitate washed first with water and afterward with alcohol, dried along with the filter at 120° to 125°, weighed and ignited. By subtracting the weight of ash from that of the precipitate, the amount of albumen is determined.

In the filtrate the peptone can be precipitated by means of tannic acid, or by phospho-tungstic and sulphuric acids.

I failed entirely in an attempt to perform an analysis by this method. Owing to the great density of a saturated solution of magnesium sulphate the caseine did not precipitate, but formed a layer on the surface of the liquid, and so slow was the operation of filtration that I did not succeed in completely washing the caseine during the course of several days.

Haidlen's Method, as Modified by Christenn. Total Solids.— Instead of drying tne milk at 110° with one-fifth of its weight of powdered gypsum,as proposed by Haidlen,Trommer proposed the use of pulverized marble, and Christenn employed powdered glass, the drying being conducted at 95° to 100° instead of 110°. Christenn found that the hygroscopic nature of the gypsum and its solubility in alcohol gave rise to errors, the latter property raising the percentage of milk-sugar and diminishing the percentage of albuminoids.[1]

Other Constituents.—To 10 grms. of milk add 10 c. c. ether add 20 c. c. alcohol, mix thoroughlv, collect the precipitated albuminoids on a weighed filter, and wash with a mixture of ether and alcohol (1:2) until the filtrate runs through clear. The precipitate, dried at 95° to 100°, gives the weight of albuminoids and insoluble salts. By ignition, the weight of the latter is obtained, and the difference gives that of the albuminoids. The weight of evaporated filtrates

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[1] The addition of gypsum, marble, glass, sand, etc., is unnecessary and a source of error.

gives the combined weight of fat, milk-sugar, and soluble salts. The loss of weight after extraction with ether gives the fat. The soluble salts and sugar are ignited, the residue treated with hot water, the solution evaporated to dryness, and ignited. The weight of this ignited portion gives the soluble salts, and the milk-sugar is found by difference.

NOTE. In the trial of this method I did not wash the precipitate of albuminoids and insoluble salts on the filter, but by decanting. The precipitate was shaken up six or eight times with the mixture of alcohol and ether, and the latter then pipetted off through a weighed filter. Finally, the albuminoids were thrown on the filter and washed exhaustively with the same mixture. The method of decantation is more rapid and thorough, but even with its aid and with the use in all of 250 c. c. of the mixed solvent, the washing of the albuminoids was incomplete, as shown by the following results of an analysis performed upon the sample, Laboratory No. 1,133.

Analysis according to the Haidlen-Christenn method :—

	Per cent.
Fat	2.90
Albuminoids	2.19
Sugar	8.23
Ash	0.21
Total solids	13.53

These various educts of the Haidlen-Christenn method were analyzed and separated into their individual constituents. The albuminoids were exhausted with ether, and the fat determined in the ethereal solution. The residue was then exhausted with water, and the sugar determined in the aqueous extract. In the final residue, containing according to Haidlen the sugar, the nitrogen was determined directly, and multiplied by 6.25 to obtain the percentage of albuminoids. The nature of the errors inherent in the method is strikingly shown when the corrected results obtained in this manner are compared with those stated in the preceding table :—

	Per cent.	Per cent.
Fat, extracted from the albuminoids	0.76	
Fat, extracted from sugar residue	2.90	
Fat, total as thus found		3.66
Albuminoids, determined by method	2.19	

Deducting fat in albuminoids_____ 0.76
Deducting sugar in albuminoids_____ 0.16
Actual albuminoids_____ 1.17
Sugar in albuminoids_____ 0.16
Sugar in final residue_____ 7.10
Actual sugar_____ ——— 7.26
Ash_____ 0.21

Total solids, as found by summation_____ 12.80
Total solids, as found by evaporation_____ 13.56

Loss_____ 1.26

This loss of 1.26 per cent. represents fat, which I did not suc-
ceed in perfectly exhausting from the sugar residue after evapora-
tion to constant weight, although the treatment with ether was
performed very many times.

Meigs's Method.[1] *Total Solids and Ash.*—Pipette off 5 c. c. of
milk into a platinum dish and weigh. Evaporate to dryness on a
water-bath to constant weight. Incinerate, best over a blast-lamp,
and weigh the ash.

Fat.—Weigh off 10 c. c. in another dish, and wash with the aid
of 20 c. c. of water into a tall 100 c. c. stoppered cylindrical gradu-
ate. Add 20 c. c. ether, stopper, shake for five minutes, then add
20 c. c. alcohol, and shake five minutes more.

Allow the cylinder to stand until the ether has risen to the top,
pipette off, add 5 c. c. ether, shake, allow to separate, pipette off,
and repeat this operation five times. Evaporate off the ether in a
weighed dish ; the increase in weight is fat.

Casein and Sugar.—The remaining contents of the graduate,
after the ethereal solution of fat has been removed, are washed in-
to a platinum dish and evaporated to dryness on a water-bath.
The residue is treated with boiling-water, and allowed to stand.
The undissolved casein precipitates, the solution of sugar is poured
off. This latter is again evaporated to dryness, and the same pro-
cess of settling and decantation repeated. This must be done four
or five times, until it is found that when boiling water is poured
upon the dry sugar it dissolves completely, no flocculi of casein
being seen in suspension. The casein residue is then, after being
dried, treated once or twice with boiling water to extract sugar.

[1] Philadelphia Medical News, June, 1882.

This sugar is added to the main portion. Both casein and sugar are then evaporated over the water-bath to constant weight, incinerated over a blast-lamp, and the losses in weight give the amounts of casein and sugar respectively.

Experimental Trial of Method. Total Solids.—In the weighing out of milk it must be poured directly into the dish in which it is weighed. If a pipette be used, the milk leaves minute particles upon its walls, and the alteration in composition thus produced is the greater, the more extensive the wetted surfaces of the measuring vessel.

Evaporation to dryness on a water-bath to constant weight is tedious, usually requiring three hours, and is neither so accurate nor so expeditious as the method of coagulation with alcohol.

Thus with sample No. 1133 :—

To 5.1195 grms. milk add 3 c. c. alcohol, evaporated to dryness on water-bath, an operation requiring one-half hour, and then to constant weight in air-bath at 105°, requiring with intervals for weighing one hour longer.

Loss of weight 0.699 grm. or 13.56 per cent.

Compare with this the results obtained by direct evaporation without coagulation.

Evaporated 5.059 grms. of same milk for three hours on water-bath.

Loss of weight, 0.6985 grm. or 13.81 per cent.

Dried the same for two hours longer in air-bath at 105°. The weight decreased to 13.59 per cent.

Dried the same for two hours longer at 103°. The weight decreased to 13.56 per cent. In other words, at the expiration of seven hours, I had obtained the same constant weight as I had found by the method of coagulation at the expiration of one and one-half hours.

The explanation of the difficulty of evaporating milk without addition of any kind is evident, the casein coagulated by heat forming a skin upon the surface of the milk which renders any further evaporation very difficult. Alcohol, on the other hand, divides the milk into fine coagula, which readily permit the escape of moisture.

Fat.—When water is present, ether will extract not only fat, but substances soluble in water. This was probably the case in

the present instance, and experiment confirmed the conjecture. After distilling off the impure either, drying the fat to constant weight at 105° and weighing, the fat thus obtained was redissolved in *absolute* ether. In every trial a residue was left behind. This residue resolved readily and in water. It proved to be milk-sugar, and its percentage was determined and added to that found elsewhere.

Casein and Sugar.—The method has two objections. The albuminoids of milk, and more especially of woman's milk, are partly soluble in boiling water, and cannot be perfectly separated from milk-sugar by its use. In the second place, the finely divided albuminoids left after evaporation to dryness and treatment with boiling water cannot be accurately separated by the crude method of settling and decantation. As a result, in case the albuminoids are washed in this manner so completely that they do not contain any milk-sugar, their amount will be much too low, whilst that of the sugar will be correspondingly too high. The percentage of albuminoids in the milk-sugar was determined by direct determination of contained nitrogen in the following test analyses.

An attempt was made to separate the albuminoids by decantation through a weighed filter, but the process was extremely tedious, the albuminoids so coagulated quickly gumming up the filter paper.

The results obtained were as follows, several analyses being made of the same sample, No. 1133.

	Per cent.
Fat, originally obtained	4.77
Fat, after redissolving in absolute ether	4.66
Containing by direct determination, milk-sugar	0.10
Fat as originally obtained	4.82
Fat, after redissolving in absolute ether	4.48

1st Trial.

Albuminoids in residue	0.79
Albuminoids in milk-sugar	0.63
Total albuminoids	1.42

2d Trial.

Albuminoids on weighed filter	0.36
Albuminoids in milk-sugar	0.71
Total albuminoids	1.07

3d Trial.

Sugar as originally determined	8.30
Add sugar contained in fat	0.34
	8.64
Deduct albuminoids contained in milk-sugar	0.72
	7.92
Actual milk sugar	

Summary of Analyses.

	Per cent. (1)	Per cent. (2)
Ash (not with blast)	0.21	0.21
Fat	4.77	4.82
Albuminoids	0.79	0.36
Sugar	8.01	8.30
	13.78	13.69

The results obtained by Meigs's method will always differ from those by Hoppe-Seyler's, Haidlen's, and Christenn's methods, and from Ritthausen's method, by giving necessarily a lower percentage of ash, a higher percentage of fat, a lower amount of albuminoids, and a larger percentage of milk-sugar. These differences are inevitable, and depend upon errors inherent in the method.

Gerber-Ritthausen's Method.—After using for a considerable length of time the methods of milk analysis in common use, the author was led by a comparison of the results obtained thereby with those found by Ritthausen's method to abandon the other methods and adopt Ritthausen's. The latter, as modified by Gerber, has now been in constant use in his laboratory for more than two years, and hundreds of analyses have been performed in accordance with it The author regards it as the only method known at the present time, which is precise and rigidly accurate. Moreover, it is so rapid, and, when familiar, so easy of execution, that its employment soon becomes a source of pleasure and satisfaction.

Details of Method. Total Solids.—Weigh off 5 grms. of milk in a tarred, covered, platinum capsule. Coagulate with absolute alchohol (about 3 c.c. are used), and evaporate to dryness on water-bath. Transfer to drying-oven, and keep at 105° C. until constant weight is attained.

Ash.—Ignite the residue first over a small flame, and finally at a dull-red heat. Cover the dish, cool the desiccator, and weigh.

Albuminoids.—Dissolve 63.5 grms. pure sulphate of copper in a liter of water. Prepare also a potash solution containing 50 grms. caustic potash in 1 liter.

Weigh out 10 grms. of milk in a covered beaker glass, and dilute with 100 c.c. water. Add 2.5 to 3 c.c. of the copper solution. Then run in sufficient potash to exactly neutralize the excess of sulphate, which will require about 1.25 to 1.5 c.c. of the potash. The coalagulated albuminoids settle immediately, leaving the liquid clear. In testing the reaction, the stirring-rod, which has been washed and withdrawn from the solution as soon as the potash has been stirred in, is dipped into the clear supernatant liquid. A drop of this liquid should turn neutral test-paper neither blue nor red. Care should be exercised not to allow the stirring-rod to bring up particles of the coagulum, since these interfere with the reaction. The clear liquid is then decanted through a filter-paper, previously dried at 110°, and weighed in a weighing-flask. The precipitate is then stirred up with 100 c.c. water, allowed to settle, the supernatant liquid again decanted through the filter, and, finally, the precipitate is washed upon it. The beaker is thoroughly cleansed with a rubber washer, and all these filtrates, amounting to about 240 c.c., are finally made up to exactly 250 c.c. for the determination of milk-sugar.

The filter paper containing the precipitate is then opened out upon a large watch-glass, and, after drying to a certain point, is divided up into small particles by a platinum spatula, and this comminution is repeated from time to time until finally the whole mass becomes a fine powder.

Fat.—The filter paper containing the precipitate is gathered up and placed loosely in a proper funnel. The beaker-glass used for the precipation is washed out with ether to dissolve any traces of fat adhering to it, and these ethereal washings are poured through the funnel and allowed to run into a small weighed flask, with which the funnel is connected by a ground-glass joint. The funnel is then connected with a return cooler, the flask carefully heated by a water-bath, and the filter paper is made to swim in the ether condensed in the funnel for about an hour, when the extraction of fat will be complete. The ether is distilled off, the flask dried at a temperature of 105°, cooled in a desiccator, and weighed. Its increment in weight gives the amount of fat.

Albuminoids.—The residue in the filter is dried at 110°, and weighed in the weighing flask until constant weight is attained. It is then ignited in a platinum crucible, and the weight of ash deducted. The loss of weight is the amount of albuminoids.

Milk Sugar.—This is determined in the filtrate by Fehling's solution. The figures thus obtained are identical with those found by evaporation of the filtrate to dryness, igniting, and subtracting ash.

In case the above method is carefully followed, the sum of the several constituents as separately determined will not differ by an appreciable quantity from the amount of solid matter as determined directly by evaporation. Thus, it will be seen from the accompanying table, giving the result of 62 separate analyses of human milk (excluding Laboratory No. 1063 as being manifestly affected by some accidental error), the maximum difference is 0.21 per cent.

The average error, as determined by ordinary arithmetical methods, is 0.001 per cent. The probable error of any individual analysis, as determined by the method of least squares, is a difference of 0.0098 per cent. in the sum of the several constituents as found by addition, and the sum as determined by direct evaporation.

This close argument does not itself prove the accuracy of the methods employed. But, in connection with the fact that an analysis of the fat showed no trace of albuminoids or sugar, that an analysis of the albuminoids revealed no sugar or fat, and that an analysis of the sugar showed no albuminoids or fat, it does afford such proof.

The only serious objection to the method is that, in the precipitation of the albuminoids by Ritthausen's solution, hydrated basic sulphate of copper is precipitated at the same time, and that this hydrate does not lose its water at the temperature at which drying of the albuminates is effected. Hence, the weight obtained would be in excess of the true amount. This objection is not borne out by the results of analyses of the precipitated cupric albuminate, since I have failed to detect in it the presence of more than traces of hydrated basic sulphate.

HISTORY OF SAMPLES ANALYZED.

Samples 42 to 55 inclusive were obtained by Dr. K. Parker from inmates of the Infants' Asylum of New York ; all others were obtained by Dr. A. M. Thomas, Chief of Medical Staff of the Emigrants' Asylum and Hospital. Both of these physicians have given their personal attention to the collection of the samples, and in every instance tabulated the physical history of the mother under the following heads :—

  I. Mother's name and nationality.
  II. Married or single.
  III. Age.
  IV. Color of hair, etc.; blonde or brunette.
  V. Period of lactation.
  VI. Right or left breast, or both.
  VII. Quantity obtained.
  VIII. Time after last nursing.
  IX. Time of day.
  X. Number of parturitions.
  XI. Presence or absence of menstruation.
  XII. Present or former illnesses. Child-bed convalescence.
  XIII. Physical antecedents of mother and parents.
  XIV. Mother's diet.
  XV. Health of infant.
  XVI. Height of infant at birth, and at collection of sample.
  XVII. Age of infant.

It is not necessary to give in detail all these statistics. The mother's diet in every instance was simple, but abundant and nutritious. Only normal milks were analyzed, such as came from healthy women ; these presented, when submitted to the microscope, a normal appearance.

The physical history of mothers and infants is given as far as our present purposes require, in the accompanying tables.

TABLE I.—HISTORY OF SAMPLES ANALYZED.

I.	II.	III.	IV.	V.	VI.		VII.	VIII.	IX.	X.	XI.
	Mo-		Color of	Period	Breast.		Interval	Par-	Infant's weight.		Infant's
No.	ther's age.	Nationality	hair.	of lac- tation.	Right	Left	since nursing.	turi- tions.	At birth.	At present.	age.
13	28	German	Brown	1 day	....	L.	2 hours	1	6 lbs. 5 oz.	....	3 days.
14	28	German	Dk. b'wn	1 "	....	L.	2 "	2	6 " 12 "	....	3 "
7	19	Irish	Dk. b'wn	2 days	¾ R.	½ L.	5 "	1	5 " 11 "	....	Died.
18	..	Nos. 7-35	......	6 "	½ R.	¾ L.					
28	..	same	......	19 "	....	L.					
35	..	mother	......	29 "	½ R.	¾ L.					
47	26	American	Brown	2 "	½ R.	½ L.	2 "	1	9 " 6¾ "	....	3 days.
6	33	Pole	Dk. b'wn	2 "	R.	....	5 "	9	7 " 0 "	6 lbs. 12 oz.	4 "
38	20	German	Brown	2 "	½ R.	¾ L.	3 "	1	8 " 11 "	....	
15	22	German	Light	3 "	....	L.	2 "	1	9 " 15 "	....	5 "
16	..	No. 15 to	A	5 "	....	L.					
26	..	No. 30	typical	13 "	....	L.	2 "				
29	..	same	Blonde	17 "	....	L.					
30	..	mother	......	27 "	½ R.	¾ L.					
40	24	Negress	Black	3 "	½ R.	¾ L.	20 min.	1	6 " 0 "	....	4 "
64	24	Hungarian	Black	3 "	R.	....	30 "	2	8 " 6 "	....	4 "
8	29	German	Lt. b'wn	4 "	....	L.	4½ hours	1	8 " 4 "	7 " 12 "	5 "
45	22	American	Brown	5 "	¼ R.	½ L.	30 min.	1	5 " 13½ "	....	5 "
67	28	Scotch	Fair	5 "	½ R.	½ L.	30 "	3	....	....	5 "
41	23	Irish	Black	6 "	½ R.	¾ L.	30 "	1	....	....	8 "
21	18	English	Black	8 "	R.	....	1 hour	1	....	....	9 "
32	28	German	Dk. b'wn	10 "	½ R.	¾ L.	0 min.	5	9 " 0 "	....	10 "
34	23	German	Brown	10 "	½ R.	¾ L.	1 hour	2	7 " 8 "	....	10 "
33	23	Irish	Dk. b'wn	11 "	½ R.	½ L.	0 "	1	8 " 4 "	....	Dead.
65	..	Dane	Light	12 "	¾ R.	L.	1 "	1	7 " 12 "	....	13 days.
4	23	Irish	Dk. b'wn	13 "	....	L.	3 hours	2	7 " 5 "	7 " 10 "	14 "
39	23	Irish	Brown	13 "	½ R.	¾ L.	0 "	2	....	....	Dead.
48	22	American	Red	17 "	½ R.	¾ L.	2 "	1	....	....	17 days.
31	20	German	Dk. b'wn	19 "	½ R.	½ L.	½ hour	..	4 " 14 "	5 " 2 "	21 "
24	29	Italian	Black	20 "	½ R.	½ L.	½ "	1	....	....	21 "
9	29	Irish	Brown	22 "	....	L.	5 hours	5	6 " 10 "	8 " 8 "	24 "
51	16	American	Dk. b'wn	23 "	....	L.	2 "	1	9 " 2 "	....	23 "
68	22	German	Lt. b'wn	23 "	¾ R.	¾ L.	1 hour	1	....	6 " 3 "	24 "
3	19	German	Brown	25 "	....	L.	4½ hours	1	7 " 0 "	7 " 8 "	27 "
5	21	Irish	Brown	26 "	½ R.	¾ L.	6 "	1	6 " 12 "	7 " 8 "	27 "
2	21	Irish	Dk. b'wn	27 "	R.	....	2 "	2	6 " 2 "	8 " 3 "	29 "
66	25	German	Dk. b'wn	30 "	¼ R.	½ L.	½ hour	2	....	....	30 "
12	23	Irish	Brown	41 "	....	L.	3 hours	1	8 " 12 "	8 " 13 "	44 "
1	19	German	Brown	45 "	½ R.	½ L.	5 "	1	7 " 8 "	8 " 2 "	45 "
17	..	same as 1	......	49 "	½ R.	½ L.				8 " 5 "	
11	18	German	Lt. b'wn	46 "	....	L.	3 "	1	6 " 0 "	8 " 0 "	48 "
20	30	Slavonic	Brown	50 "	¾ R.	½ L.	½ hour	2	5 " 8 "	9 " 8 "	52 "
23	26	Bohemian	Brown	53 "	R.	....	1 "	6	....	....	55 "
10	25	Scotch	Brown	82 "	....		5 hours	2	6 " 10 "	11 " 3 "	83 "
53	19	Irish	Red	88 "	¼ R.	¾ L.	2 "	1	7 " 8 "	13 " 5 "	88 "
27	28	German	Lt. b'wn	89 "	¼ R.	¾ L.	¾ hour	1	....	....	90 "
52	26	Swedish	Light	90 "	¼ R.	¾ L.	2 hours	1	7 " 5 "	11 " 3 "	92 "
55	27	German	Brown	93 "	¼ R.	½ L.	3 "	1	5 " 8 "	....	Still-born.
25	20	Irish	Brown	115 "	¼ R.	¾ L.	2 "	1	2 " 8 "	....	116 days.
19	23	Irish	Dk. b'wn	126 "	½ R.	½ L.	1 hour	1	7 " 8 "	13 " 11 "	128 "
54	19	German	Dk. b'wn	132 "	½ R.	¾ L.	2 hours	1	8 " 13 "	14 " 7 "	132 "
43	30	American	Brown	150 "	½ R.	¾ L.	2 "	3	7 " 14 "	13 " 4½ "	150 "
42	20	Irish	Brown	167 "	½ R.	¾ L.	2 "	1	6 " 13½ "	13 " 12½ "	167 "
22	33	Swedish	Brown	180 "	½ R.	¾ L.	¼ hour	1	....	....	Dead.
44	25	American	Light	180 "	½ R.	¾ L.	2 hours	3	7 " 12 "	22 " 7 "	182 days.
46	24	Mulatto	Black	186 "	½ R.	¾ L.	2 "	2	5 " 13 "	15 " 4½ "	186 "
50	21	American	Lt. b'wn	217 "	¼ R.	½ L.	2 "	1	....	15 " 3 "	218 "
49	19	Irish	Lt. b'wn	270 "	¼ R.	½ L.	2 "	1	6 " 13 "	16 " 9½ "	272 "
60	25	Scotch	Lt. b'wn	21 "	¼ R.	½ L.	5 min.	1	....	5 " 8 "	21 "
61	28	German	Brown	12 "	¼ R.	½ L.	5 "	2	....	7 " 10 "	13 "
62	30	Irish	Black	27 "	½ R.	½ L.	5 "	1	7 " 8 "	....	29 "
63	22	Irish	Lt. b'wn	19 "	½ R.	½ L.	5 "	1	....	8 " 3 "	21 "
56	..	French	Dk. b'wn 210 "	R.	....	1 hour	1	....	18 " 0 "	210 "	
57	..	Irish	Brown 90 "	R.	....	2 hours	1	....	13 " 10 "	90 "	
58	..	Irish	Dk. b'wn 153 "	1½ R.	½ L.	2 "	1	....	14 " 2 "	153 "	
59	..	Irish	Lt. b'wn 92 "	R.	....	2 "	3	....	13 " 4 "	92 "	
36 37	..	....	......				Descriptions lost.				

TABLE II.—ANALYSES OF 80 SAMPLES OF HUMAN MILK.

Number on blank.	Laboratory number	Color.	Spec. grav.	Albuminoids.	Milk-sugar.	Fat.	Solids not fat.	Ash.	Total solids by addition of constituents.	Total solids directly by evaporation.	Difference.
1	1021	Yellow	1.0321	1.44	7.20	5.58	8.81	0.17	14 39	14.46	—0.07
2	1022	......	1.0351	1.68	7.53	3.55	9.42	0.21	12 97	12.84	+0.07
3	1023	White	1.0353	1.96	7.31	4.62	9.45	0.18	14.07	13.96	+0.11
4	1024	......	1.0346	1.73	7.25	2.95	9.19	0.18	12.11	11.96	+0.15
5	1025	White	1.030	1.49	7.23	2.12	8.90	0.18	11.02	11.11	—0.09
6	1026	Yw.-white	1.030	1.45	7.24	3.20	8.93	0.24	12.13	12.10	+0.03
7	1027	Yellow	1.034	3.12	6.47	5.49	9.91	0.32	15.40	15.35	+0.05
8	1028	Yellow	1.030	2.15	6.51	2.31	8.94	0.28	11.25	11.40	—0.15
9	1029	......	1.032	2.05	7.08	3.00	9.26	0.13	12.26	12.31	—0.05
10	1030	......	1.030	1.43	7.19	2.11	8 81	0.19	10.92	10.91	+0.01
11	1031	......	1.031	1.98	6.99	3.06	9.17	0.20	12.23	12.21	+0.02
12	1032	......	1.031	1.76	6.97	2.44	8.93	0.20	11.37	11.40	—0.03
13	1033	......	1.030	2.40	6.45	6.01	9.07	0.22	15.08	15.07	+0.01
14	1034	......	1.012	2.52	6.44	4.95	9.23	0.27	14.18	14.16	+0.02
15	1035	......	1.032	2.18	6.75	2.84	9.06	0.13	11.90	11.88	+0.02
16	1036	Yellow	1.030	0.85	5.50	6.16	6.57	0.22	12.73	12.73	0.00
17	1037	Yellow	1.034	1.49	7.37	5.02	9.03	0.17	14.05	14.18	—0.13
18	1038	Dull-white	1.033	3.95	7.92	4.37	12.09	0.22	16.46	16.55	—0.09
19	1039	......	....	....	....	....	....	0.15	......	12.34	....
20	1040	......	....	....	....	....	....	0.30	......	14.08	....
21	1041	......	....	....	....	....	....	0.22	......	13.01	....
22	1042	......	....	....	....	....	....	0.21	......	12.74	....
23	1043	......	1.030	2.10	6.61	4.02	8.91	0.20	12.93	12.88	+0.05
24	1044	......	1 030	1.94	7.45	3.61	9.56	0.16	13.17	13.02	+0.15
25	1045	......	1.032	2.16	7.00	5.84	9.38	0.22	15.22	15.18	+0.04
26	1046	......	1.030	2.08	6.98	3.28	9.26	0.20	12.54	12.39	+0.15
27	1047	......	1.031	1.98	7.00	2.44	9.19	0.21	11.63	11.84	—0.21
28	1048	White	1 031	2.23	7.39	2.95	9.83	0.21	12.78	12.95	—0.17
29	1049	White	1.030	1 81	6.88	2.80	8.89	0.20	11.69	11.70	—0.01
30	1050	Yw.-white	1.031	2.11	7.41	5.04	9.72	0.20	14.76	14.69	+0.07
31	1051	Chalky-white	1.033	2.27	6.75	5.96	9.17	0.15	15.13	15.21	—0.08
32	1052	Yw.-white	1.030	1.53	5.84	5.62	7.21	0.14	12.83	12.99	—0.16
33	1053	Yellow	1.030	2.24	6.25	2.76	8.84	0.35	11.60	11.45	+0.15
34	1054	Chalky-white	1.034	2.19	7.46	6.89	9.90	0.25	16.79	16.66	+0.13
35	1056	White	1.032	2.43	7.34	3.13	9.98	0.21	13.11	13.20	—0.09
36	1057	Yellow	1.032	2.43	7.23	3.79	9.88	0.22	13.67	13.63	+0.04
37	1058	Chalky-white	1.032	1.60	7.55	6.21	9.37	0.22	15.58	15.45	+0.13
38	1064	White	1.021	1.82	6.96	3.97	8.97	0.19	12.94	12.87	+0.07
39	1065	Yw.-white	1.030	2.33	5.78	4.21	8.32	0.21	12.53	12.57	—0.04
40	1066	Yellow	1.032	1.75	6 94	3.68	8.97	0.28	12.65	12.52	+0.13
41	1067	White	1.031	2.45	6.08	3.82	8.72	0.19	12.54	12.41	+0.13
42	1055	White	1.031	1.97	7.38	4.16	9.60	0.25	13.76	13.60	+0.16
43	1059	Chalky-white	1.031	1.50	7.32	3.77	9.00	0.18	12.77	12.64	+0.13
44	1060	White	1.030	1.49	7.31	4.34	9.01	0.21	13.35	13.17	+0.18
45	1061	Yw.-white	1.031	2.33	7.48	2.47	9.97	0.16	12.44	12.36	+0.08
46	1062	White	1.031	1.35	7.24	4.09	8.89	0.31	12.98	13.15	—0.17
47	1063	Yellow	1.032	4.86	5.40	3.36	9.46	0.20	13.82	13.35	+0.47
48	1068	Yw.-white	1.032	1.93	6.95	5.59	9.06	0.18	14.65	14.58	+0.07
49	1069	White	1.031	2.00	6.95	4.64	9.16	0.21	13.80	13.74	+0.06
50	1070	White	1.031	2.06	6.39	4.75	8.62	0.22	13.44	13.48	—0.04
51	1071	Yellow	1.030	2.42	6.95	5.60	9.56	0.19	15.16	15.25	—0.09
52	1072	White	1.030	2.15	6.76	6.78	9.07	0.16	15.86	15.89	—0.04
53	1073	White	1.029	1.82	6.83	4.28	9.02	0.37	13.30	13.30	0.00
54	1074	Yw.-white	1.030	1.50	7.34	3.10	8.92	0.18	12.02	12.12	—0.10
55	1075	White	1.026	2.43	6.57	4.94	9.27	0.27	14.21	14.20	+0.01
56–59	1133	......	1.0297	1.16	7.41	4.74	8.78	0.21	13.57	13.63	—0.06
60–63	1134	......	1.0296	1.95	7 02	3.85	9.19	0.22	13.04	13.12	—0.08
64	1135	......	1.0312	2.00	6.69	3.96	9.01	0.32	12.97	13.05	—0.08
65	1137	......	1.0319	2.25	7.12	5.85	9.52	0.15	15.37	15.35	+0.02
66	1138	......	1.0307	1.11	7.07	2.73	8.40	0.22	11.13	11.13	0.00
67	1139	......	1.0322	1.96	7.28	4.74	9.54	0.30	14.28	14.28	0.00
68	1140	......	1.0317	2.17	7.44	4.36	9.90	0.29	14 26	14.26	0.00
Robust	6 cases	......	1.031	1.44	6.94	3.71	8.63	0.25	12.34	12.37	—0.03
Anæmic	6 cases	......	1.031	2.12	6.74	3.96	9.02	0.22	13.10	13.08	+0.02
Maximum		......	1.0353	4.86	7.92	6 89	12.09	0.37	16.79	16.66	0.21
Minimum		......	1.0260	0.85	5.40	2.11	6.57	0.13	10.92	10.91	0.00
Average		......	1.0313	1.995	6.936	4.131	9.137	0.201	13.268	13.267	0.001

COMPARISON OF FINAL RESULTS WITH PREVIOUS ANALYSES.

Analyses of Eighty Samples of Woman's Milk.

Reaction uniformly alkaline.

	Average.	Minimum.	Maximum.
I. Specific gravity	1.0318	1.0260	1.0353
II. Albuminoids	1.995	0.85	4.86
III. Sugar	6.986	5.40	7.93
IV. Fat	4.181	2.11	6.89
V. Solids not fat	9.187	6.57	12.09
VI. Ash	0.201	0.18	0.87
VII. Total solids (by addition of constituents)	18.368	10.92	16.79
VIII. Total solids (directly by evaporation)	18.267	10.91	16.66
IX. Difference between VII. and VIII.	0.001	9.00	0.21
X. Water	86.732	80.08	88.21

The most interesting comparison which can be made is that with the results given by König (*Chemie der Mensch. Nahrungs und Genussmittel*), which are deduced from the analyses of 190 samples. These analyses, it should be remembered, were performed according to the most adverse methods, errors in opposite directions operating to mutually compensate one another.

Analyses of samples of woman's milk (König) :—

	Average.	Maximum.	Minimum.
Albuminoids	1.94	0.57	4.25
Sugar	6.04	4.11	7.80
Fat	3.90	1.71	7.60
Ash	0.49	0.14	1.78(?)
Water	87.09	83.69	90.90

As might be anticipated, the extremes are wider apart than in my own analyses, but the general mean of all, with exception of the ash, is tolerably concordant.

Omitting particular reference to the results of Fernois and Becquerel and earlier investigations, I will quote further only the results of Gerber (mean of six analyses), Christenn and Marchand (*Beilstein's Handb. der Organ. Chem., 2081*).

	Gerber.	Christenn.	Marchand.
Albuminoids	1.8	1.9	1.7
Sugar	5.4	6.0	7.1
Fat	5.3	4.3	3.7
Solids not fat	7.2	8.2	9.0
Ash	0.4	0.3	0.2
Total solids by evaporation	10.9	12.8	12.7
Water	89.1	87.2	87.3

Biedert (*loc. cit.*) found the albuminoids to vary, in the samples which he analyzed, between 1.5-2.4 per cent.; fat, between 3.8 to 4.4 per cent. His mean for albuminoids is 1.95; my own is 1.995; König's is 1.94 per cent.

Two per cent., therefore, may be regarded, without sensible error, as *the average amount of abuminoids in woman's milk.*

The more extended series of eighty analyses confirm, however, the statements made in my earlier paper (that on Infant Foods), the albuminoids being the most variable constituent of woman's milk, the fat the next most variable, and the sugar the least. Nor have I any reason to alter the interpretation therein given of the physiological signification of the greater and less variability of the individual constituents.

RELATIONS BETWEEN THE PHYSICAL HISTORY OF THE MILK AND ITS COMPOSITION.

Relations between the physical history of the milk and its composition.

The only relations which I shall attempt to discuss here are those appertaining to the

1st. Color, taste, consistency, and specific gravity.

2d. Age of the mother.

3d. Period of lactation, and interval since nursing.

4th. Nationality.

5th. Physical constitution of the mother.

I. *Color, Taste, etc.*—Whether bluish-white, chalky-white, whitish, yellowish-white, or yellow, the color is no indication of the composition. For example, the milk of a German brunette, taken one hour after previous nursing and during the tenth day of lactation, was chalky-white in color, whilst it contained 6.89 per cent. of fat. This was the largest percentage of fat in any sample. On the other hand, though many of the yellow samples were rich in fat, other yellow samples were very poor. Thus, No. 8 was yellow (the milk being drawn during the fourth day of lactation, and four and one-half hours after nursing), while it contained only 2.31 per cent. of fat.

Taste.—Although the amount of sugar in woman's milk is large, being nearly 7 per cent. or 2 per cent. more than in cow's milk, it is rarely sweet to the taste. Usually, it has a more or less saline, somewhat disagreeable animal flavor.

Consistency.—Although the amount of solids in woman's milk is decidedly greater than in cow's milk, its consistency is much thinner and more watery.

Specific Gravity.—The average is somewhat greater than in cow's milk, though the entire range of variation is not very different. Thus, in the 80 samples examined, the average specific gravity is 1.0313, the minimum 1.0026 the maximum 1.0353. Conrad obtained in 130 observations for the two last figures 1.025 and 1.039. In 147 samples of normal cow's milk L. Janke found 1.0245 for the minimum, 1034 for the maximum, and 1.0297 for the mean.

II. *Age of Mother.*—The milk of women under the age of 20 is richer in each and every constituent than that of older women. The general average of *albuminoids* for the first lustrum is 2.18 per cent., while it is only 1.92 per cent. for the second, and 2.10 for the third. The difference is still more striking in regard to sugar. In the first lustrum the sugar is 7.17 per cent., falling to 6.91 in the second lustrum, and in the third only 6.77 per cent. This falling off is notable, not only in the percentages, but in the number of samples which exceed the average. Thus, in the first lustrum, 83 per cent. of the whole number of samples exceed the general average in sugar, while in the second lustrum only 60 per cent. exceed. A similar diminution is observable in the fat and total solids.

TABLE III.—MILK OF WOMEN FROM 15 TO 20 YEARS OF AGE.

(First lustrum.)

A = No. of cases above or below the general average.
B = Averages for A.
C = Averages for women from 15 to 20 years of age.
D = General averages for all years.

No. of sample	Albuminoids Above av.	Albuminoids Below av.	Milk sugar Above av.	Milk sugar Below av.	Fat Ab. av.	Fat Bel. av.	Solids not fat Above av.	Solids not fat Below av.	Ash Above av.	Ash Below av.	Total solids Above av.	Total solids Below av.
7	3.12	......	......	6.47	5.49	......	9.91	......	0.32	......	15.35	
18	3.95	......	7.92	......	4.37	......	12.09	......	0.22	......	16.55	
28	2.23	......	7.39	......	......	2.95	9.83	......	0.21	......	......	12.95
35	2.43	......	7.34	......	......	3.13	9.98	......	0.21	......	......	13.20
21	......	......	......	......	......	......	......	......	......	......	......	13.01
51	2.42	......	6.95	......	5.60	......	9.56	......	......	0.19	15.25	
3	......	1.96	7.31	......	4.62	......	9.45	......	......	0.18	13.96	
1	......	1.44	7.20	......	5.58	......	......	8.81	......	0.17	14.46	
17	......	1.49	7.37	......	5.02	......	......	9.03	......	0.17	14.18	
11	......	1.98	6.99	......	......	3.06	9.17	......	......	0.20	......	12.21
53	......	1.82	......	6.83	4.28	......	......	9.02	0.37	......	13.30	
54	......	1.50	7.34	......	......	3.10	......	8.92	......	0.18	......	12.12
49	2.00	......	6.95	......	4.64	......	9.16	......	0.21	......	13.74	
A	VI.	VI.	X.	II.	VIII	IV.	VIII.	IV.	VI.	VI.	VIII.	V.
B	2.70	1.69	7.27	6.65	4.95	3.06	9.89	8.94	0.26	0.18	14.60	12.29
C	2.18		7.17		4.32		9.58		0.22		13.87	
D	1.995		6.936		4.131		9.137		0.201		13.267	

TABLE IV.—MILK OF WOMEN FROM 20 TO 25 YEARS OF AGE.

(Second lustrum.)

A = No. of cases above or below the general average.
B = Averages for A.
C = Averages for women from 20 to 25 years of age.

No. of sample	Albuminoids.		Milk-sugar.		Fat.		Solids not fat.		Ash.		Total solids.	
	Above av.	Below av.	Above av.	Below av.	Ab. av.	Bel. av.	Above av.	Below av.	Above av.	Below av.	Above av.	Below av.
38	......	1.82	6.96	......	......	3.97	......	8.97	......	0.19	....	12.87
15	2.18	......	......	6.75	......	2.84	......	9.06	......	0.13	....	11.88
16	......	0.85	......	5.50	6.10	......	......	6.57	0.22	......	....	12.73
29	......	1.81	......	6.88	......	2.80	......	8.89	......	0.20	....	11.70
30	2.11	......	7.41	......	5.04	......	9.72	......	......	0.20	14.69	
40	......	1.75	......	6.94	......	3.68	......	8.97	0.28	......	....	12.52
64	2.00	......	......	6.69	......	3.96	......	9.01	0.32	......	13.05	
45	2.33	......	7.48	......	......	2.47	9.97	......	......	0.16	....	12.36
43	......	1.50	7.32	......	......	3.77	......	9.00	......	0.18	....	12.64
34	2.19	......	7.46	......	6.89	......	9.90	......	......	0.25	16.66	
33	2.24	......	......	6.25	......	2.76	......	8.84	0.35	......	....	11.45
4	......	1.73	7.25	......	......	2.95	9.19	......	......	0.18	....	11.96
39	2.33	......	......	5.78	4.21	......	......	8.32	0.21	......	....	12.57
48	......	1.93	6.95	......	5.59	......	......	9.06	......	0.18	14.58	
31	2.27	......	......	6.75	5.96	......	9.17	......	......	0.15	15.21	
68	2.17	......	7.44	......	4.36	......	9.90	......	......	0.29	14.26	
5	......	1.49	7.23	......	......	2.12	......	8.90	......	0.18	....	11.11
2	......	1.68	7.53	......	......	3.55	9.42	......	......	0.21	....	12.84
12	......	1.76	6.97	......	......	2.44	......	8.93	......	0.20	....	11.40
25	2.16	......	7.00	......	5.84	......	9.38	......	......	0.22	15.18	
42	......	1.97	7.38	......	4.16	......	9.60	......	......	0.25	13.60	
33	2.24	......	......	6.25	......	2.76	......	8.84	0.35	......	....	11.45
46	......	1.35	7.24	......	......	4.09	......	8.89	0.30	......	....	13.15
50	2.06	......	......	6.39	4.75	......	......	8.67	0.22	......	13.48	
26	2.08	......	......	......	......	3.28						
19	......	......	......	......	......	......	......	......	......	0.15	....	12.34
A	XIII.	XII.	XIV.	X.	X.	XV.	IX.	XV.	XIII.	XII.	IX.	XVI.
B	2.18	1.64	7.26	6.41	5.40	3.16	9.58	8.80	0.27	0.17	14.52	12.18
C	1.92		6.91		4.05		9.09		0.22		13.02	

TABLE V.—MILK OF WOMEN FROM 25 TO 30 YEARS OF AGE.

(Third lustrum.)

A = No. of cases above or below the general average.
B = Averages for A.
C = Averages for women from 25 to 30 years of age.
D = General averages for all ages.

No. of sample	Albuminoids.		Milk-sugar.		Fat.		Solids not fat.		Ash.		Total solids.	
	Above av.	Below av.	Above av.	Below av.	Ab. av.	Bel. av.	Above av.	Below av.	Above av.	Below av.	Above av.	Below av.
13	2.40	......	......	6.45	6.01	......	......	9.07	0.22	......	15.07	
14	2.52	......	......	6.44	4.95	......	9.23	......	0.27	..•...	14.16	
47	4.86	......	......	5.40	......	3.36	9.46	......	......	0.20	13.35	
8	2.15	......	......	6.51	......	2.31	......	8.94	0.28	......	....	11.40
67	......	1.96	7.28	......	4.74	......	9.54	......	0.30	......	14.28	
32	......	1.53	......	5.84	5.62	......	......	7.21	......	0.14	....	12.99
24	......	1.94	7.45	......	......	3.61	9.56	......	......	0.16	....	13.02
9	2.05	......	7.08	......	......	3.00	9.26	......	......	0.13	....	12.31
66	...	1.11	7.07	......	......	2.73	......	8.40	0.22	......	....	11.13
23	2.10	......	......	6.61	......	4.02	......	8.91	......	0.20	....	12.88
10	......	1.45	7.19	......	......	2.11	......	8.81	......	0.19	....	10.91
27	1.98	......	7.00	......	......	2.44	9.19	......	0.21	......	....	11.84
52	2.15	......	......	6.76	6.78	......	......	9.07	......	0.16	15.89	
55	2.43	......	......	6.57	4.94	......	9.27	......	0.27	......	14.20	
43	......	1.50	7.32	......	......	3.77	......	9.00	......	0.18	....	12.64
44	......	1.49	7.31	......	4.34	......	......	9.01	0.21	......	....	13.17
A	VIII.	VIII.	VIII.	VIII.	VII.	IX.	VII.	IX.	VIII.	VIII.	VI.	X.
B	2.58	1.62	7.21	6.32	5.34	3.04	9.36	8.71	0.25	0.17	14.49	12.23
C	2.10		6.77		4.04		9.00		0.21		13.08	
D	1.995		6.936		4.131		9.137		0.201		13.267	

This research affords no adequate data as to the rate of decrease beyond the age of 30 years. The only complete analysis bearing upon this point is that of the milk of a dark haired, black eyed swarthy Pole, of gross habit and enormous breast development, who, at the age of 33 years, had been the mother of nine children. Two ounces were drawn from the right breast only, five hours after previous nursing. It was low in specific gravity, and yellow in color. It contained :—

	Per cent.
Albuminoids	2.24
Sugar	6.25
Fat	2.75
Solids not fat	8.84
Ash	0.85
Total solids	11.45

III. *Period of Lactation, etc.*—If we divide this period into four intervals, the first extending from the beginning of lactation to the eleventh day after; the second from the eleventh to the thirty-first day; the third from the thirty-first to the ninety-first day; the fourth from the ninety-first day to the tenth month of lactation, we shall note the following changes :—

Albuminoids are greatest in the first interval, being 2.32 per cent. In the second, they exceed the general average, being 2.09 per cent. In the third interval they fall as much below the average as in the first they exceeded it, remaining at a low figure during the rest of lactation.

Sugar is least immediately after parturition and much below the average, whilst it is above and nearly constant during the three remaining periods.

Fat, like the albuminoids, is much in excess of the general average immediately after parturition, being 4.93 per cent. After the eleventh day it falls, being only 3.97 per cent.

The saline constituents are nearly constant during all stages of lactation, although slightly in excess during the first ten days.

The sum of solids not including fat does not vary greatly. Its amount in the first interval is 9.15 per cent., the general average being 9.14.

Interval since Nursing.—Nearly all the samples were drawn two hours after nursing, but certain ones, more especially Nos. 18, 32, 33, 39, were drawn immediately. In fat, albuminoids, salts, and total solids, they were in excess of the general average.

TABLE VI.—MILK OF WOMEN FROM FIRST TO ELEVENTH DAY OF
LACTATION.

A = No. of cases above or below the general average.
B = Averages for A.
C = Averages from the first to eleventh day of lactation.
D = General averages from the 1st to 270th day of lactation.

No. of sample	Day	Albuminoids		Milk-sugar		Fat		Solids not fat		Ash		Total solids	
		Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Above av.	Below av.
13	1	2.40	......	......	6.45	6.01	......	......	9.07	0.22	......	15.07	
14	1	2.52	......	......	6.44	4.95	......	9.23	......	......	0.27	14.16	
7	2	3.12	......	......	6.47	5.49	......	9.91	......	0.32	......	15.35	
47	2	4.86	......	......	5.40	......	3.36	9.46	......	......	0.20	13.35	
6	2	......	1.45	7.24	......	......	3.20	......	8.93	0.24	......	......	12.10
38	2	......	1.82	6.96	......	......	3.97	......	8.97	......	0.19	......	12.87
15	3	2.18	......	......	6.75	......	2.84	......	9.06	......	0.13	......	11.88
40	3	......	1.75	......	6.94	......	3.68	......	8.97	0.28	......	......	12.52
64	3	2.00	......	......	6.69	......	3.96	......	9.01	0.32	......	13.05	
8	4	2.15	......	......	6.51	......	2.31	......	8.94	0.28	......	......	11.40
16	5	......	0.85	......	5.50	6.16	......	......	6.57	0.22	......	......	12.73
45	5	2.33	......	7.48	......	......	2.47	9.97	......	......	0.16	......	12.86
67	5	......	1.96	7.28	......	4.74	......	9.54	......	0.30	......	14.28	
18	6	3.95	......	7.92	......	4.37	......	12.09	......	0.22	......	16.55	
41	6	2.45	......	......	6.08	......	3.82	......	8.72	......	0.19	......	12.41
21	8	......	......	......	......	......	......	......	......	......	......	......	13.01
32	10	......	1.53	......	5.84	5.62	......	......	7.21	......	0.14	......	12.99
34	10	2.19	......	7.46	......	6.89	......	9.90	......	0.25	......	16.66	
A		XI.	VI.	VI.	XI.	VIII.	IX.	VII.	X.	XI.	VI.	VIII.	X.
B		2.74	1.56	7.40	6.28	5.53	3.29	10.01	8.54	0.26	0.17	14.81	12.43
C		2.32		6.67		4.93		9.15		0.23		13.48	
D		1.995		6.936		4.181		9.137		0.201		13.267	

TABLE VII.—MILK OF WOMEN FROM THE 11TH TO 31ST DAY OF LACTATION.

No. of sample.	Day.	Albuminoids		Milk-sugar.		Fat.		Solids not fat.		Ash.		Total solids.	
		Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Above av.	Below av.
33	11	2.24	......	......	6.25	......	2.76	......	8.84	0.35	......	....	11.45
65	12	2.25	......	7.12	......	5.85	......	9.52	......	......	0.15	15.35	
26	13	2.08	......	6.98	......	......	3.28	9.26	......	......	0.20	....	12.39
4	13	......	1.73	7.25	......	......	2.95	9.19	......	......	0.18	....	11.96
39	13	2.33	......	......	5.78	4.21	......	......	8.32	0.21	......	....	12.57
29	17	......	1.81	......	6.88	......	2.80	......	8.89	......	0.20	14.69	
48	17	......	1.93	......	......	5.59	......	......	9.06	......	6.18	14.58	
28	19	2.23	......	7.39	......	......	2.95	9.83	......	0.21	......		12.95
31	19	2.27	......	......	6.75	5.96	......	9.17	......	......	0.15	15.21	
24	20	......	1.94	7.45	......	......	3.61	9.56	......	......	0.16	....	13.02
9	22	2.05	......	7.08	......	......	3.00	9.26	......	......	0.13	....	12.31
51	23	2.42	......	6.95	......	5.60	......	9.56	......	......	0.19	15.25	
68	23	2.17	......	7.44	......	4.36	......	9.90	......	0.29	......	14.26	
3	25	......	1.96	7.31	......	4.62	......	9.45	......	......	0.18	13.96	
5	26	......	1.49	7.23	......	......	2.12	......	8.90	......	0.18	....	11.11
60-3	26	......	1.95	7.02	......	......	3.85	9.19	......	0.22	......	....	13.12
2	27	......	1.68	7.53	......	......	3.55	9.42	......	0.21	......	....	12.84
30	27	2.11	......	7.41	......	5.04	......	9.73	......	......	0.20	14.69	
35	29	2.49	......	7.34	......	......	3.13	9.98	......	0.21	......	....	13.20
66	30	......	1.11	7.07	......	......	2.73	......	8.40	0.22	......	....	11.13
A		XI.	IX.	XVI.	IV.	VIII.	XII.	XIV.	VI.	VIII.	XII.	VIII.	XII.
B		2.23	1.76	7.22	6.42	5.02	3.23	9.50	8.74	0.24	0.17	14.75	12.25
C		2.09		7.06		4.00		9.27		0.201		13.25	
D		1.995		6.936		4.131		9.137		0.201		13.267	

TABLE VIII.—MILK OF WOMEN FROM THE 31ST TO 91ST DAY OF LACTATION.

No. of sample.	Day.	Albuminoids		Milk-sugar		Fat.		Solids not fat.		Ash.		Total solids.	
		Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Above av.	Below av.
13	41	......	1.76	6.97	......	......	2.44	......	8.93	......	0.20	....	11.40
1	45	......	1.44	7.20	......	5.58	......	......	8.81	......	0.17	14.46	
17	49	......	1.49	7.37	......	5.02	......	......	9.03	......	0.17	14.18	
11	18	......	1.98	6.99	......	......	3.06	9.17	......	......	0.20	....	12.21
20	50	......	......	......	......	......	......	......	......	0.30	......	14.08	
23	53	2.10	......	......	6.61	......	4.02	......	8.91	......	0.20	....	12.88
10	82	......	1.45	7.19	......	......	2.11	......	8.81	......	0.19	....	10.91
53	88	......	1.82	......	6.83	4.28	......	......	9.02	0.37	......	13.30	
27	89	1.98	......	7.00	......	......	2.44	9.19	......	0.21	......	....	11.84
52	90	2.15	......	......	6.76	6.78	......	......	9.07	......	0.16	15.89	
A		III.	VI.	VI.	III.	IV.	V.	II.	VII.	III.	VII.	V.	V.
B		2.07	1.66	7.12	6.73	5.41	2.81	9.18	8.94	0.29	0.18	14.38	11.85
C		1.60		6.99		3.97		8.99		0.22		13.11	
D		1.995		6.936		4.131		9.137		0.201		13.267	

TABLE IX.—MILK OF WOMEN FROM THE 91ST DAY TO THE 10TH
MONTH OF LACTATION.

No. of sample	Day	Albuminoids		Milk-sugar.		Fat.		Solids not fat.		Ash.		Total solids.	
		Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Ab've av.	Bel'w av.	Above av.	Below av.
55	93	2.43			6.57	4.94		9.27		0.27		14.20	
25	115	2.16		7.00		5.84		9.38		0.22		15.18	
19	126										0.15		12.34
54	132		1.50	7.34			3.10		8.92		0.18		12.12
56-9	136		1.16	7.41		4.79			8.78	0.21		13.63	
43	150		1.50	7.32			3.77		9.00		0.18		12.64
42	167		1.97	7.38		4.16		9.00		0.25		13.60	
22	180									0.21			12.74
44	180		1.49	7.31		4.34			9.01	0.21			13.17
46	186		1.35	7.24			4.09		8.89	0.30			13.15
50	217	2.06			6.39	4.75			8.67	0.22		13.48	
49	270	2.00		6.95		4.64		9.16		0.21		13.74	
A	IV.	VI.	VIII.	II.	VII.	III.	IV.	VI.	IX.	III.	VI.	VI.
B	2.16	1.50	7.24	6.48	4.78	3.65	9.35	8.88	0.23	0.17	13.97	12.69
C	1.78		7.09		4.44		9.07		0.22		13.34	
D	1.995		6.936		4.131		9.137		0.201		13.267	

IV. *Nationality.*—The statistics are entirely too meager to de-
termine the influence of nationality. It would be necessary to
obtain for each race a large collection of results, in which the other
causes of variation, like age, period of lactation, etc., were allowed
for or eliminated. This has never been done, and would require
not eighty, but many hundred analyses.

The difficulty of generalization upon these points can be most
forcibly illustrated by comparing the analysis of sample No. 40,
which was obtained from a negress, with the other samples, and
with the general average. Neither in color, smell, or other phys-
ical characteristics, nor in chemical constitution, was this one sam-
ple so markedly different from the others as to be put, as some
have proposed to do with the milk of negro women, in a class by
itself.

V. *Physical Constitution of the Mother.*—A comparison of the
physical characteristics of the mother, whether blonde or brunette,
or more minutely, as to color of eyes, hair, complexion, etc., has
not shown that these differences are necessarily related to corre-
sponding differences in the composition of the milk. But actual
differences in the physical condition of the mother are intimately
related. The samples obtained from women of over-robust habit
were not so rich in albuminoids as those from pronouncedly anæmic

women; and, generally speaking, the best milk was obtained from lean women in good physical condition.

Graphic Chart.—A great deal of labor was devoted to the preparation of a graphic chart of the results of the analyses performed during the course of the present investigation. It was thought that the study of such a chart might reveal some law governing the relative amounts of the various constituents, which law might escape notice in comparing merely tabulated figures. The chart represents the results grouped according to the period of lactation, and follows the same order as that of Table I. In case, however, a number of samples were obtained from the same mother on different dates, these analyses are represented consecutively. These exceptions to the general order of arrangements are to be noted in samples 7, 18, 28 and 35, in samples 15, 16, 26, 29 and 30, and in samples 1 and 17. The horizontal lines in the chart represent differences of one-fifth of one per cent.; the vertical columns represent the sample analyzed.

One feature the chart exhibits in the most striking manner, and that is the great variability in the constition of women's milk. The proportion of fat more especially varies in an exceedingly arbitrary manner.

per

Total Solids.

Solids not Fat.

Milk Sugar.

Fat.

Albuminoids.

Ash.

women; and, generally speaking, the best milk was obtained from lean women in good physical condition.

Graphic Chart.—A great deal of labor was devoted to the preparation of a graphic chart of the results of the analyses performed during the course of the present investigation. It was thought that the study of such a chart might reveal some law governing the relative amounts of the various constituents, which law might escape notice in comparing merely tabulated figures. The chart represents the results grouped according to the period of lactation, and follows the same order as that of Table I. In case, however, a number of samples were obtained from the same mother on different dates, these analyses are represented consecutively. These exceptions to the general order of arrangements are to be noted in samples 7, 18, 28 and 35, in samples 15, 16, 26, 29 and 30, and in samples 1 and 17. The horizontal lines in the chart represent differences of one-fifth of one per cent.; the vertical columns represent the sample analyzed.

One feature the chart exhibits in the most striking manner, and that is the great variability in the constition of women's milk. The proportion of fat more especially varies in an exceedingly arbitrary manner.

Total Solids.

Solids not Fat.

Milk Sugar.

Fat.

Albuminoids.

Ash.

Additions to the Library of the American Chemical Society

June 1 to Oct. 1, 1884.

PRESENTED BY THE AUTHORS.

Oscar Loew and Thomas Bokorny. Die Chemische Kraftquelle im Lebenden Protoplasma. Acquired by Gift or Exchange.

Presented by Prof. A. R. Leeds :
"Annual Report of the Chief Engineers of the Philadelphia Water Department for 1883."

From the Royal Society of New South Wales :
"Journal and Proceedings, 1882."

From the Academie des Sciences, Paris :
"Comptes Rendu, Vol. 96."

From the Secretario de Fomento, Mexico :
"Antonio Pennafiel Memoria Sobres las Aguas Potable de la Capital Mexico."

From the North Carolina Agricultural Experiment Station :
"Annual Report for 1879, '80, '81, '82 and '83."
"Chas. W. Dabney. "North Carolina Phosphates."
"Catalogue of the North Carolina Exhibits at the American Exposition, Boston, 1883."
"Analyses and Valuation of Fertilizers made up to May 1st, 1884."

From the Massachusetts State Agricultural Experiment Station :
"Bulletin No. 10, June 1884 ; No. 11, Sept. 1884."

From the Bureau of Statistics, Washington, D. C.:
"Quarterly Report of the Chief of the Bureau of Statistics, No. 3, 1883."

From the American Institute of Mining Engineers :
"Memorial of the Alexander Lyman Holley C. E., L.L. D."
"List of Officers and Members."

Discussion of Mr. P. G. Saloms paper on "Physical and Chemical Tests of Steel for Boiler and Ship plate for the United States Government Cruisers."
"Proceedings of the Chicago Meeting."

J. Birkinbine. "The Cerro de Mercado (Iron Mountain) at Durango, Mexico."
—— " Roasting Iron Ores."
J. C. Bayles. " The Study of Iron and Steel."
W. Lee Brown. " A Complete Gas Assaying Plant."
B. W. Cheever. " The Estimation of Phosphorus in Iron and Steel."
—— " Segregation of Impurities in Bessemer Steel Ingots on Cooling."
S. B. Christy. " The Miner's Fund of New Almaden."
P. Frazor. " Certain Silver and Iron Mines in the States of Nuevo, Leone,and Coahuila, Mexico."
H. C. Freeman. " The Hydraulic Cement Works of the Utica Cement Co., La Salle, Ill."
J. Gjers. " Rolling Steel Ingots with their Own Initial Heat."
J. H. Hammond. " The Cauca Mining District, U. S. of Colombia, S. A."
J. S. Harris. " The Beneficial Fund of the Lehigh Coal and Navigation Company."
Wm. Kent. " Water Tube Steam Boilers at the Lucy Furnaces, Pittsburg, Pa."
J. B. Mackintosh. " The Influence of Organic Matter and Iron on the Volumetric Determination of Manganese."
G. W. Mainard. " Biographical Notice of Sir C. W. Siemens D. C. L., L.L. D., F. R. S."
F. H. McDowell. " Recent Improvements in Copper Smelting."
J. E. Mills. " A New Method of Shaft Sinking Through Water Bearing Loose Material."
M. W. Perry. " A New Mineral."
R. W. Raymond. " The Law of the Apex."
J. H. Seaman. " Note on Patching Platinum Crucibles."
Wm. P. Shinn. " The Distribution of Steam in Cities."
C. A. Stetefeldt. " Russell's Improved Process for the Lixiviation of Silver Ores."
A. F. Wendt. " A Blast Furnace with Bosh Walter Jacket and Iron Top."
—— " The Concentration of Iron Ores."
E. B. Wilson. " The Wolf Safety Lamp."

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—November 7th, 1884.

The meeting was called to order at 8:40 P. M., Dr. J. C. Booth in the chair.

The minutes of the meetings of September 19th and October 3rd were read and approved.

The following gentlemen were elected members of the Society.

George H. Weiss, 100 Bedford avenue, Brooklyn, E. D.

E. A. Von Schweinitz, of the University of North Carolina, Chapel Hill, N. C.

Launcelot W. Andrews, 419 Broadway, Cambridge, Mass.

Conrad Braker, Jr., of 215 Pearl street, New York, was elected an Associate.

The following Associates were proposed for regular member-

ERRATA.

p. 262, 5th line from top, for "This residue resolved readily and in water, read, " This residue dissolved readily in water."

p. 266, 9th line from bottom, for " XVI. Height of infant," read, XVI. Weight of infant."

p. 269. In table, 16th line from top, for 9.00, read 0.00 ; 17th line from top, for 80.08, read 83.21 ; for 83.21, read 89.08.

p. 271, 7th line from top, for 1.0026, read 1.026 ; 10th line from top, for 1034, read 1.034.

p. 279, 19th line from top, for constition, read constitution; 21st line from top, after " manner," add : But as to any fixed and definite relation governing the proportion of the constituents to each other, or to the sum total of the solid constituents, the graphic chart thus far has failed to afford a satisfactory indication.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

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The following Associates were proposed for regular membership :—

Nathaniel Hathaway, New Bedford, Mass.

Clement Le Boutillier, 50 East 25th street, New York.

Charles A. Wittmack, P. O. Box, 1032, New York.

All proposed by F. V. Pool, Wm. Rupp, and J. B. Mackintosh.

Dr. J. C. Booth read a paper on Graphite or Black Lead Crucibles.

* Dr. C. E. Munsell distributed copies of his report to the New York State Board of Health on Fresh and Condensed Milk.

Dr. Leeds moved that a meeting of the Board of Directors be called for Thursday, November 13th, at 4 P. M., at 117 Pearl street, carried.

Drs. Waller, Endemann and Munsell were appointed a Committee on Nomination of Officers for the year 1885.

The following papers were announced :

Mr. J. H. Stebbins. On the Spectroscopic Examination of Methylen Blue and Lauth's Violet.

Dr. A. R. Leeds. On a New Form of Butyrometer.

The meeting was then adjourned.

<div style="text-align:right">

C. E. MUNSELL,

Recording Secretary.

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* A copy of this report will be sent to members of the Society on application to the author, 128 Worth street, N. Y.

GRAPHITE, OR BLACK LEAD CRUCIBLES.

By J. C. Booth, Ph.D.

The use of graphite for pencils, stove blacking, lubricating sur-
faces, &c., is extremely limited, compared with its enormous value
and consumption in crucibles, employed in melting gold, silver, cop-
per, brass, bronze, German silver, &c., and especially in smelting the
finest steel for tools, for the tires of locomotive driving wheels, and
even for the ponderous shafts of the great ocean steamers; in short,
wherever the finest quality of steel is demanded in the arts.   Such
steel being a marked expression of the physical power of civiliza-
tion, the chief means of procuring the black lead crucible has the
strongest claim on our attention.

In studying its manufacture I shall successively consider, 1. the
materials employed ; 2. their preparation and mixture ; 3. the
formation and completion of the crucible.

Materials.—A black lead crucible is essentially composed of
graphite or black lead ground to fine scales, which are rigidly
held in their position by partially melted clay ground up with pow-
dered graphite and a little sand, the last being added to prevent
shrinkage while drying, and the dried crucible, made from this
mixture, is finished by burning at a high heat.

Since black lead is virtually pure carbon, the question arises
why might not the cheapest form of carbon, Anthracite, be substi-
tuted for it? Because of the difference in their mechanical structure
and their behavior to heat.

All the forms of carbon combine with the oxygen of the air at a
high heat, and gradually burn away into carbonic acid or oxide, but
graphite burns much more slowly than any other form (except the
diamond).   All the forms except graphite, at a strong heat, below
combustion, crackle into a fine, structureless powder, or are easily
ground into powder, the particles of which have no property or
means of cohesion, nor of adhesion to other bodies, and cannot
therefore be made into a tough, coherent crucible.

Black lead has an eminently laminated, crystalline structure,
breaking into thin scales, but not at right angles to their plane, for,
however thin a piece may appear to the eye, it breaks into still
thinner scales, of the same structure and toughness as the original.
A single thin scale held in a delicate forceps shows a remarkable

degree of elasticity, when bent, by springing back to its original position unaltered.   Neither a low heat nor a white heat will make it exfoliate.

It appears, then, that the distinctive properties of graphite for crucibles are, that it retains the flat or scaly form, even under hard grinding, and at the highest heats; that the scales are extremely elastic and tough, and that it resists combustion in the air much more than the ordinary forms of carbon.

Varieties of Graphite.—It occurs in three forms, the elastic laminated, the elastic fibrous, and the more amorphous variety.   As the elastic fibrous variety may be used indifferently with the scaly, and is quite rare, we need not dwell upon it.   I have termed the third form *more* amorphous, because it sometimes has the external appearance of the scaly variety, and does often contain some of it. A little experience will enable one to distinguish it by the eye, and a simple test will establish a more reliable estimate of value.   A minute quantity, finely ground in a mortar, will approximately show the proportionate quantity of scaly and shapeless powder, and the conclusion may be strengthened by sifting it through a piece of fine muslin, when the eye can sufficiently determine the relative quantity of each.   Since the amorphous variety, although deceptively crystalline in appearance, adds but little, if anything, to the strength of a crucible, the manufacturer should avoid its use as much as practicable.   I think that my experience will bear me out in saying, that only at an enormous reduction in relative price, and even then only a small proportion of it, compared with the best scaly kind, will warrant the manufacturer of black lead crucibles in employing it, at the great risk of his reputation, for the best black lead crucible.

Commercial graphite occurs as "lump-lead," "grains" and "dust." During some years' experience in making black lead crucibles, I found that by far the greater part of the graphite of commerce consisted of the excellent scaly variety, whether in lump or grains, and therefore giving no pretext for using inferior graphite, except the unsoundness of false economy.   I found a barrel entirely filled by one piece of the best Ceylon graphite, and single lumps of several pounds weight each, are of frequent occurrence and of the best quality.   A few of the smaller lumps, up to ¼ lb. weight, are of the deceptive amorphous variety, which is, however, more often present in the fine powder with an iron black, lustreless appearance.   Graph-

ite in clean, sifted grains, free from powder, is generally of excellent
quality. The best variety has a silvery lustre, the next lower grade,
although it may be of fair quality, has a bright, steel lustre, and the
lower the grade the more it puts on an iron black, or sometimes a
brownish tint.

I have found the impurity of ground commercial lump lead of
the best quality to be about 6 per cent., and to consist chiefly of
quartz and iron pyrites. On the other hand, I have seen silvery
graphite in grains of the uniform size of about $\frac{1}{8}$ inch, and with-
out dust, which was almost absolutely pure carbon.

Localities.—Graphite is abundantly distributed in metamorphic
rocks, but rarely in large masses together. Many localities have
been explored with a view to its use for crucibles, but almost all
were successively abandoned, because of the excessive cost of ex-
traction, and in a few cases because of its inferior quality.

The island of Ceylon contributes the great mass of black lead
to commerce; 14,000 tons having been shipped from it in 1883.
Most fortunate is it that nearly all of it is of the best quality.

We find small quantities of it sparingly distributed in all the
States of the Union and in every country on the globe where met-
amorphic influences have imparted a crystalline structure to the
lower geological formations. It has been extracted at several dif-
ferent times [from the locality in Philadelphia, Penn., within ten
miles of the centre of the city, and with partial success. The
quality is good, but lacks mass *in loco*.

When called upon to explore the locality, I took the bearing of
the adjacent gneiss, &c., and, applying it to the shaft which struck
the graphite, I found it pointed exactly to the various openings from
which the latter had been extracted. The rocks in contact with and
containing the graphite, are so highly metamorphosed and confused
with crystallization, that the planes of stratification are only re-
cognizable by experience. Since the rocks are stratified, they were
once deposited sands and clays, with the remains of plants that
grew on them, condensed and modified into coal, which probably
passed through the changes of lignite, bituminous coal and anthra-
cite into graphite.

ABSTRACTS.

Arseniomolybdic Acid. O. Pufahl.

Barium molybdate, when suspended in an aqueous solution of arsenic acid and decomposed with the equivalent amount of H_2SO_4, yields a yellow solution, which on concentration deposits crystals of arseniomolybdic acid. Crystallizing in orange red doubly-refracting needles not affected by the atmosphere. (*Ber. d. ch. Ges., 213, 1884.*) J. H. S., Jr.

Chemical Action with Carbon and its Compounds. G. Gore.

A series of 44 experiments in which the attempt is made, through a variety of reactions, to separate carbon in the elementary state, and to discover new facts in regard to carbon and some of its compounds. (*Chem. News L. 125.*) A. A. B.

On the connection between Pseudo Solution and True Solution. W. W. J. Nichol.

The well known Brownian motion of small particles suspended in a liquid being regarded as a consequence of molecular impacts, is applied by the author to support the *molecular* as distinguished *hydrate* theory of solution. According to the former theory, the solution of a salt in water is a consequence of the superior attraction of the molecules of water for those of the salt as compared with the cohesion of the salt itself. Substances are soluble in inverse proportion to their cohesion. Cohesion being destroyed by subdivision, a finely divided substance remains suspended for a long time in water. Such suspension or *pseudo solution* differs only from true solution in respect to fineness of division of the solid. If subdivision could be carried to the isolation of the molecules, true solution would result, and substances thus dissolved, could separate from solution only slowly in spite of the superior cohesion of their molecules, because aggregations of these molecules sufficiently large to separate themselves from solution could only occasionally be found. As an instance of this we have slow precipitation of many insoluble substances from solution when cold and dilute. (*Chem. News L. 124.*) A. A. B.

On Pyridine-Carbo-Acids. E. Nölting and A. Collin.

I. The pyridinecarbo-acid, which is obtained from chinoline by oxidizing with potassium permanganate, has both its carboxyl-groups in the ortho-position. It may therefore he looked upon as a phthalic acid, in which a CII group has been replaced by a nitrogen atom.

II. On the Formation of Blue from Rosaniline.

It is known that when aniline, orthotoluidine, or paratoluidine are treated to 180° C. with rosaniline and benzoic acid, a blue dyestuff is formed. Metatoluidine acts similarly. (*Ber. d. ch. Ges.,* *258 1884,*).   J. H. S., Jr.

On the Constitution of Styphnic Acid. E. Nölting and A. Collin.

Styphnic acid, or trinitroresorcine, can have only one of the three following constitutional formulæ, viz.:

I.
OH
NO$_2$ NO$_2$ OH
NO$_2$

II.
OH
NO$_2$ NO$_2$ OH
NO$_2$

III.
OH
NO$_2$ NO$_2$ OH
NO$_2$
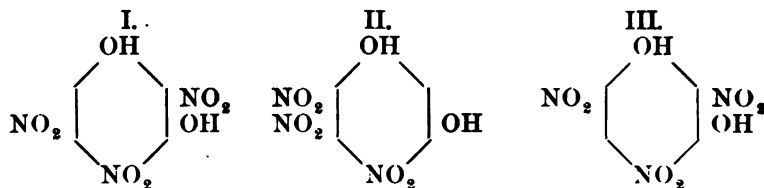
Bantlin, who obtained it from metanitrophenole, gives it the formula indicated under I. In I. as well as in II., two of the nitrogroups hold symmetrical positions in relation to one another, and according to Laubenheimer's rule, should, when heated with alkalies, be split off as nitrites.

III. if converted into the corresponding ether, and then treated with alkalies, would split up into styphnic acid. The authors conclude that styphnic acid is constituted as represented under formula III. (*Ber. d. ch. Ges., 281, 1884.*)   J. H. S., Jr.

On Nitrosophenoles. H. Goldschmidt.

In a previous article the author described certain compounds produced by the action of hydroxylamine on diketones and chinones. This article is a continuation of the previous one, and describes the behavior of benzochinone and β-naphthochinone towards hydroxylamine. 1 part chinone was dissolved in 300 parts

H_2O, and to this was added an aqueous solution of hydroxylamine chloride. The mixture was now allowed to rest for 12 hours until the smell of chinone had disappeared. It was then shaken up with bone black, filtered, and extracted with ether. After concentrating the solution in vacuo, long, colorless needles were obtained, which on analysis were found to be benzochinoneoxim. β-naphthochinone and hydroxylamine chloride yielded β-naphthochinoneoxim. (*Ber. d. ch. Ges., 210, 1884.*) J. H. S., JR.

On the Separation of Zinc and Nickel. T. MOORE.

Evaporates to reduce excess of acid, dissolves residue in 20-25 c. c. of water, precipitates with excess of ammonium sulphide, dissolves precipitate in solution of KCN, with aid of heat, and dilutes to 250 c. c.; then adds a few c. c. of sodium acetate solution, acidifies with acetic acid and heats to boiling. ZnS separates ; it is allowed to stand several hours, then washed by decantation with hot water containing a little sodium acetate and H_2S ; the precipitate is weighed after conversion to ZnO. Filtrate and washings are evaporated to dryness with aqua regia, the residue is dissolved, and the solution precipitated with KHO and Br. The precipitate is finally dissolved in H_2SO_4, and after addition of NH_4HO, Ni is precipitated by the battery. Results very accurate and process rapid. (*Chem. News L. 157.*) A. A. B.

A New Test for Nitrous Acid. RAPHAEL MELDOLA.

Para-amidodimethylaniline, on being treated with nitrous acid, is converted into the diazo-compound—$C_6H_4.N$
$$\begin{array}{l} \diagup N = N - R. \\ \diagdown N = N - C_6H_4N \\ \quad (CH_3)_2. \end{array}$$

The tetrazo-salt C_6H_4
$$\begin{array}{l} \diagup N_2.Cl. \\ \diagdown N_2C_6H_4N(CH_3)_2 \end{array} \Bigg\} \text{ possesses the re-}$$
markable property of assuming a deep blue coloration when its dilute aqueous solution is exposed to the air; this property makes it valuable as a test for nitrous acid.

In order to prepare the substance, paranitraniline is diazotized in the usual manner, and combined with the theoretical amount of dimethylaniline. The crystalline precipitate formed is collected on a filter, washed and reduced with ammonium sulphide. The

reduction product is poured into cold water, which, after a while causes the basic matter to separate. This is collected on a filter, washed and dissolved in dilute HCl., in the proportion 0.5 grm. to 1 litre. This solution has a deep red color.

If a solution is to be tested for nitrous acid, add a few drops of the coloring matter to it, then a few drops of HCl, and finally, add ammonia till the blue coloration appears.

This test shows the reaction with a solution composed of $\frac{1}{64}$ grm. $NaNO_2$, in one litre H_2O, or 1 pt. $Na.N^2O$ in 6,400 pts. of water. This dyestuff may be kept in solution a long time without deterioration. (*Ber d. ch. Ges.*, 256. 1884.) J. H. S., JR.

On Dyestuffs, resulting from the Simultaneous Oxidation of Paradiamines with Monamines. R. NIETZKI.

In a previous communication it was shown that the dyestuffs produced by the simultaneous oxidation of paradiamines with monamines are converted by reducing agents into bases which are amido-derivatives of diphenylamine. Thus Bindschedler's dimethethyphenylen green splits up, on reduction, into tetramethyldiamido diphenylamine. Shortly after this Majirt applied for a patent in which he described a process for producing methylen blue by the oxidation of a sulphuretted hydrogen solution of tetramethyldiamidodiphenylamine. The author had likewise observed this reaction, but comes to the conclusion that methylen blue had not been formed synthetically from tetramethyldiamidodiphenylamine. On treating a sulphuretted hydrogen solution of the above base with Fe_2Cl_6 the solution turns green, but not blue. Thus dimethylphenylen green is formed, notwithstanding the large excess of ferric chloride. Only after long standing and repeated addition of H_2S and Fe_2Cl_6, did he succeed in obtaining a pure blue solution, from which only 5% coloring matter was obtained. The formation of methylen blue may, however, be easily explained. Dimethylphenylen green is easily decomposed with acids, splitting up into chinones, dimethylamine and dimethylparaphenylendiamine, viz.:

$$C_{16}H_2N_3Cl + 2H_2O = C_6H_4O_2 + NH (CH_3)_2 + (CH_3)_2 N-C_6H_4 NH_2 + HCl.$$

It is therefore probable that the dimethylparaphenylendiamine, in the nascent state, on coming in contact with the sulphuretted hydrogen is converted into methylen blue. If the blue were

formed directly from the dimethylphenylen green a much larger
yield should be obtained than is actually the case. (*Ber. d. ch.
Ges.*, *217, 1884*.)   J. H. S., JR.

On the Detection of Adulterations in Portland Cements.
R. FRESENIUS and W. F. FRESENIUS.

The analysis is treated under the following heads :
(*a*) Specific gravity.
(*b*) Loss of weight on ignition.
(*c*) Behavior with water, including alkalinity of aqueous solutions.
(*d*) Behavior with dilute acids.
(*e*) Behavior with permanganate solution.
(*f*) Behavior with CO_2.

(*a*) This is determined by Schumann's method, which depends upon
the space occupied by a volume of cement of known weight. The
cement is introduced into a graduated flask filled with turpentine.
The change of level is noted. The number of c. c. replaced by the
cement, divided by the weight of the latter, give the Sp. Gr. It
was found that pure Portland cement has a density of not
less than 3.1, whereas adulterated cements have much lower
densities.

(*b*) Two grms. cement are heated in a platinum crucible over a
Bunsen burner to constant weight ; 20 minutes heating is sufficient.

(*c*) The behavior of cements with water is characteristic. Various
samples treated in the same manner impart to water different
amounts of alkaline matter.

1 grm. of finely pulverized substance is shaken up with
100 c. c. distilled water for 10 minutes, the mixture filtered,
and 50 c. c. of the filtrate titrated with $\frac{1}{10}$ volume HCl. The re-
sults indicate a decided difference between Portland and hydraulic
cements.

(*d*) 1 grm. substance, finely pulverized, is treated with 30 c. c. in
HCl and 70 c. c. water, and shaken up for 10 minutes, then
filtered, and 50 c. c. of the filtrate titrated back with NaHO.
From the figures so obtained the number of c. c. HCl, neutralized

by 1 grm. of cement, are calculated. These figures are lower for slag powder than for Portland cement.

(e) 1 grm. finely pulverized cement is treated with 150 c. c. of a mixture of 1 pt. dilute H_2SO_4 (sp. gr. 1.12) and 2 pts. H_2O, and then permanganate* sol. is run in until the solution reddens. 1 grm. Portland cement decolorizes from 0.17—0.53 c. c. corresponding to 0.79—2.8 mg. $KMnO_4$. Various samples of slag powder required from 9.5—16 c. c. corresponding to 44.34—74.67 mg. $KMnO_4$.

(f)This test is made to determine whether the so-called free lime, which should not be found in Portland cements, exists in hydraulic cements.

3 grms., finely powdered, are placed in a weighed glass tube, and submitted to the action of dry carbonic acid, at the ordinary temperature, for two hours. The increase in weight gives the amount of CO_2 absorbed. 3 grms. cement should not absorb more than 1.8 mg. CO^2. Cements yielding figures which do not fall within these limits may be regarded as adulterated. (*Fres. Zeit.*, 1884, 175.)   J. H. S., Jr.

Copper Oxychloride as a Paint. T. MAXWELL LYTE.

In a letter to the editor of the *Chemical News* the author suggests the use of copper oxychloride for painting the interior of water tanks, and points out that while the salts of copper and mercury are active poisons to plants and infusorial life, the salts of the latter are too violently poisonous to be used in this case. Insoluble salts of copper, like the oxychloride, on the contrary, while fatal to vegetable growths and microbia, would be less liable to contaminate water for domestic use than the lead paints commonly used. The copper salt should be isolated from the surface of the iron by a coating of magnesia or zinc paint upon which it could then be laid. (*Chem. News L. 152.*)   A. A. B.

* 24.30 c. c. permanganate represents 0.2 grms. Fe. dissolved as ferrous salt.

Abstract of American Patents Relating to Chemistry.

From the Official Gazette of the U. S. Patent Office.

(Addenda to April 8th, 1884, p. 203.)

296,483.—Manufacture of paper.—W. Rupp.

Substitutes infusorial earth for a portion of the paper stock in the manufacture of absorbent paper.

June 17, 1884.

300,352.—Tanning process.—S. S. Eddy.

First subjects the pickled hides to an acidulating composition, washes drains and completes the operation of tanning with an alkaline tanning com position.

300,383.—Apparatus for distilling wood.—J. A. Matthieu.

300,384.—Distillation of wood.—J. A. Matthieu.

300,385.—Retort for carbonizing wood.—J. A. Matthieu.

The above three patents cannot be described without the specifications and drawings.

300,436.—Process of removing tannic acid from coffee.—H. H. Beach.

Treats coffee for the removal of tannic acid and other deleterious substances therefrom by heating the green coffee to 212° Fahr., and removes the matter extracted from the berry.

300,464.—Compound material for the manufacture of sheets, boards, blocks, artificial wood, etc.—L. Haas.

Vegetable fiber, leather or shoddy waste, crude asbestos, litharge and thinned asphaltum blended with sulphur, pitch and whiting.

300,466.—Process and apparatus for manufacturing gas.—J. Hanlow.

Decomposes steam by means of heated fuel, charges with hydrocarbon and fixes the mixture of gas and vapors in a previously heated fixing chamber.

300,497.—Apparatus for treating leather stock with naptha to extracts oils.—F. F. Newall.

300,560.—Compound for the manufacture of artificial stone.—H. Bening.

Sand, cement, oxalic acid, chalk, muriatic acid, iron filings and water.

300,599.—Process of and apparatus for crystallizing tin.—G. R. Habe nicht.

Consists in heating and cooling the plates, subjecting them to a solution of caustic soda to remove the oxide coating and finally developing the crystallization by subjecting the plates to the action of an acid.

300,700.—Method of manufacturing starch.—H. Duryea.

Applies a solution of alkali to the condensed starch water by which a stratification of the resultant liquor into a solution of starch, and one of glutinous matters is effected, and removes them separately.

300,729.—Fire and waterproof compound.—O. F. Parsons.

Coal tar, air-slaked lime,Spanish brown, sulphur, litharge, fine salt and American ochre.

300,747.—Process of treating iron.—B. Woodruff.

Consists in repeated heating at increasing temperatures, alternated with rolling or pressing into it sand, common salt, black oxide of manganese, and before or after fashioning the metal as required, heating it to about a welding point and hardening or tempering it.

June 24th, 1884.

300,752.—Apparatus for generating gas or vapor from liquid hydro. carbons.—A. J. Ambler.

300,778.—Process of and apparatus for treating fibrous plants.—J. A· Hitter.

Subjects them to the action of steam which has passed through a solution of sulphate of iron and soft soap.

300,802 and 300,803.—Process of and apparatus for manufacturing illuminating gas.—S. C. Salisbury.

300,811.—Apparatus for the continuous distillation of oil.—H. C. Smith.

Fractional distillation of the oil, which descends through a series of pipes arranged in an inclined plane in a heated chamber.

300,826.—Process of producing steel from wrought iron with plumbago.— W. A. O. Wuth.

Charges the furnace with pieces of wrought iron having a low percentage of phosphorus in layers with a thin stratum of plumbago between the layers of iron, melting the charge in the open hearth and finally adding to the melted metal spiegeleisen or ferro-manganese.

300,874.—Production of coloring matter from dinitrophenal.—F. Krüger, G. Tobias and E. Kegel.

Production of dinitrophenolsulphonic acid and its salts, by means of nitrating phenolsulphonic acid or mononitrophenolsulphonic acids or their salts.

300,890.—Liquid cement for giving a cheap and durable metal coating to papiermache, plaster of paris, clay, &c.—F. Philipp.

300,928.—Apparatus for the manufacture of vinegar.—A. Wecker.

Not intelligible without the drawing.

300,950.—Process of an apparatus for the separation of metals from ores and alloys.—H. R. Cassel.

Consists in charging the auriferous ore or alloy in a powdered condition into an anode compartment, which is separated from the cathode compartment by porous material, said anode compartment containing a solution yielding nascent chlorine under the action of an electric current, and agitating the powdered material within the said solution during the passage of the electric current.

300,951.—Process of chloridizing ores by electrolysis.—H. R. Cassel.
Subjects the ore to the action of a solution yielding chlorine under electrolytic decomposition.

301,006.—Art of manufacturing fermenting materials.—F. A. Reihlen.
A ferment composed of a foundation of a vegetable fiber and of a deposit of fungoid growths formed thereon.

301,015.—Filtering composition.—R. M. Sommers.
Gravel, white bar-sand, animal charcoal and phosphate of lime.

301,033.—Apparatus for concentrating sulphuric acid.—M. Willett.
Not intelligible without the drawing.

301,069.—Treatment of vegetable fibrous material.—A. Prinz.
Maceration in an attenuated solution of chloride of lime and subsequent boiling under pressure in an alkaline lye combined with a hydrocarbon or a sulphide of carbon.

10,491.—Reissue, Original No. 227,352, May 8, 1883.—E. Scherff.
Not intelligible without the specification.

July 1st, 1884.

301,092.—Apparatus for generating heating gas.—S. N. Carvalho.
The gas is produced from hydrocarbons with the aid of steam, superheaters &c.

301,149.—Mixed paint.—H. C. Petty.
For the preparation of which no less than fifteen more or less compatible substances are required.

301,222.—Sulphur refining apparatus.—F. Dickert.

301,248.—Treating phosphates of alumina and iron.—G. A. Liebig and J. F. Gibbons.
Not intelligible without the specification.

301,383.—Manufacture of carbonate of strontium.—E. A. Mebus and J. W. De Castro.
Consists in reducing sulphate of strontium into an exceedingly fine condition, in mixing it with sufficient water to maintain it in suspension therein and in treating it with carbonate of ammonium or ammonia and carbonic acid.

301,390.—Ice and refrigerating machine.—P. G. and C. A. Randall.
Relates to improvements in an ammonia ice machine.

301,406.—Manufacture of alkaline phosphates.—S. G. Thomas.
Consists in treating in a basic lined Siemens furnace or Bessemer converter alkaline chlorides with molten phosphoric iron and an air blast or iron oxide, washing the gases for hydrochloric acid, lixiviating the resulting phosphatic slag and precipitating the solution with milk of lime, whereby caustic alkali and precipitated calcium phosphate are obtained.

301,407.—Manufacture of alkaline phosphates.—S. G. Thomas.
Manufactures soluble alkaline phosphates from phosphoric non-silicious

molten pig iron in a basic lined Siemens furnace or Bessemer converter by pouring the molten metal upon an alkaline carbonate in such a furnace or vessel, turning on the blast, and with the blast introducing a further quantity of the carbonate, the alkali rising through the bath and combining with the nascent phosphoric and silicic acids and forming a slag of phosphate and silicate of soda and potash, then running off this slag while hot, lixiviating it, and evaporating or precipitating the solution with milk of lime.

301,436.—Method of manufacturing starch.—H. Duryea.

Combines the condensed starch water with a solution of caustic alkali, agitates the mixture about four hours and then separates the nearly pure starch from the glutinous solution.

301,457.—Ice machine.—J. Patten.

An ice machine where cold is produced by the vaporization of a portion of the ice, alternate moistening of the surface of the ice, then exposing it to a high vacuum, causing the moisture and a portion of the ice to vaporize at the expense of heat from the remaining portion of ice, thereby reducing its temperature, so that when it is again brought in contact with water a thin layer will freeze and congeal to it.

July 8th, 1884.

301,469.—Process of and 301,469, Apparatus for treating and improving petroleum.—H. R. Angus.

Consists in floating the oil on heated water in a closed tank, continuously introducing steam or heated water therein, flowing off the surplus water at the surface to impart motion to the oil toward the outlet, and at the same time forcibly removing the volatile products generated from the oil.

301,475.—Process of printing indigo colors.—J. Bracewell.

Prepares the fabric with a solution of grape sugar or glucose, then prints a mixture of alkali and indigo upon such fabric and subjects the same to the action of steam.

301,518.—Apparatus for the manufacture of lamp black.—F. K. Plumbly.

Mechanical arrangements for collecting the cooled lamp black and conveying it to a receiver.

301,531.—Apparatus for manufacturing gas.—J. L. Stewart.

Steam is decomposed by incandescent fuel, the gases mixed with the vapors from coal and oil and converted into a fixed gas in a fixing chamber.

301,617.—Process of and apparatus for manufacturing artificial stone.—A. A. McCandliss.

Washes the sand with water, steam and sulphuric acid, mixes with a plastic material, places the molded shapes in a curing room and again subjects them to steam, the vapors of sulphuric, hydrochloric or carbonic acids.

301,686.—Portable distilling apparatus.—L. Smith.

301,708.—Apparatus for the treatment of bones, phosphatic residues, &c.—C. W. Flodquist.

Not intelligible without the drawing.

301,782.—Composition for removing scale from steam boilers.—A. Wilson.

Decoction of tan bark, ooze and catechu, logwood, chestnut leaves, spruce hemlock leaves, gallnuts and sumac bark, carbonate of soda, oil of sassafras and alcohol.

301,783.—Method of refining and deodorizing oils and fats.—E. S. Wilson.

Consists in first forming a soap or emulsion of the material with caustic soda lye by heat and then applying chlorinated alkaline or chlorine to it.

301,802.—Manufacture of yellow coloring matter.—H. Caro and H. Kern.

As a new product, the yellow coloring matter or dye stuff described in the specification, which, when dissolved in alcohol and treated first with sodium-amalgam and then with acetic acid and heat, is decomposed into tetramethyl-diamido-benzhydrol and ammonia.

July 15th, 1884.

301,894.—Filtering apparatus.—C. F. Holdship.

A filter consisting of a series of removable sections for filtering petroleum and similar liquids.

301,910.—Barometer.—J. Y. McCleary.

301,971.—Apparatus for reclaiming glutin or glutinous matters from the spent liquor of starch works.—W. Duryea.

A combination of mechanical devices for obtaining the above result.

302,130.—Gas generating and consuming furnace for heating retorts.—J. T. Hasse.

Not intelligible without the drawings.

302,132.—Tanning and dressing old leather and articles of same.—E. M. Hewitt.

302,138.—Bleaching-Keir.—C. L. Jackson and J. Westley.

302,158.—Process of producing a metal high in phosphorus and carbon and low in silicon.—J. Reese.

Consists in smelting iron ores with suitable charges of coke, limestone and phosphorized basic slag in a blast furnace, and then running the molten metal into a silicious-lined open hearth and treating it therein until the metal begins to boil and the elimination of the carbon commences, whereby a metal high in phosphorus and carbon and practically free from silicon is produced.

302,163.—Apparatus for cooling and impregnating air and other gases.—J. A. Saladin.

Brings air or other gas continuously into contact with water or other liquid in finely divided condition.

302,170.—Manufacture of brown coloring matter.—J. H. Stebbins. Jr.

As a new product, the brown coloring matter described in the specification, which, when treated with reducing agents—such as tin and hydrochloric acid—splits up into beta-amidophenanthrene, aniline, and sulphanilic acid.

<div align="center">July 22nd, 1884.</div>

302,266.—Treating phosphates for fertilizers.—G. A. Liebig and J. F. Gibbons.

Relates to the treatment of mineral phosphates containing iron and alumina for the purpose of converting them into complete commercial fertilizers.

302,294.—Method of and apparatus for compressing and liquefying gases and producing refrigeration.—J. J. Suckert.

302,326.—Apparatus for purifying water.—R. d'Heureuse.

Forces air through the water.

302,387.—Sugar mixing and cooling apparatus.—G. Engel.

Mechanical device for bringing the sugar into contact with large volumes of air.

302,443.—Process of absorbing heat from rooms or material by use of a liquefied gas.—J. J. Suckert.

<div align="center">July 29th, 1884.</div>

302,544.—Bluing paper.—G. A. Conant.

Paper saturated with solution of Prussian blue, oxalic acid and sugar.

302,646.—Composition and manufacture of brick or artificial stone.—G. R. Bare and J. A. Douglass.

Sand, cement, water, water slaked lime, asbestos, coloring matter, molded and passed successively through soap and alum baths.

302,679.—Process of making and composition for pavements and other purposes.—J. E. Wynkoop.

Furnace slag, sand, Portland cement and lime water.

302,739.—Process of and means for filtering and decolorizing syrups and saccharine juices.—F. Kleeman.

Consists in first adding to the liquor broken or pulverulent brown coal, tertiary coal, lignite, or peat, and then passing the liquor through the usual filtering device.

302,742.—Composition for filling wood.—M. Kunz.

Alcoholic solution of finely ground glue and benzine or oil of turpentine.

302,790.—Azo coloring matter.—A. Spiegel.

An azo-compound derived from dichlorphenolbetanaphthol, being distinguished by its being soluble in water with a yellow color, and when an alkali is added to the solution, or when boiled with a nitrite, the bisulphite compound is decomposed and a bluish violet salt is precipitated.

302,791.—Fastening azo-colors on yarn or textile fabrics.—A. Speigel.

Impregnates such fibre or fabric with the bisulphite compounds of azo-coloring matters formed from diazo-compounds, combined with aromatic hydroxylated bodies or phenols, together with salts of alumina, iron or chromium, and then exposing the fibre so impregnated to the action of heat or to the action of an alkaline agent, or of a hot solution of a nitrite.

302,800.—Manufacture of hydrogen dioxide.—M. Traube.

Consists in bringing water and a flame of carbonic oxide or other gas into contact with each other.

302,819.—Cartridge and method of waterproofing the same.—P. Aarbe.

August 5th, 1884.

302,882.—Apparatus for ageing of liquors.—E. H. Ashcroft.

Injects air.

302,909.—Apparatus for the manufacture of gas.—G. W. Harris and A. L. Allen.

302,970.—Cleansing compound.—J. B. Ziebach.

Deodorized gasoline, sulphuric ether, alcohol, egg, oil of citronella, and oil of lavender.

303,065.—Process of bleaching vegetable tissues.—J. A. Southmayd.

Treats first with permanganate of potash to destroy coloring matter, then neutralizes with oxalic acid, sulphite of sodium, &c.

303,093.—Process of and apparatus for the manufacture of compressed asphaltum blocks.—W. S. Wilkinson.

303,141.—Process of separating the insoluble from the soluble matter in corn and malt mashes.—A. E. Ferve.

Adds towards end of boiling, for each barrel, about one ounce of Irish moss or gelatinous substance.

303,142.—Process of manufacturing beer, syrup, &c.—W. E. Ferve.

Consists in first saturating the corn meal with cold water, then adding malt in limited proportion, then heating the mixture, causing the starch cells to burst, then separating the liquid constituents from the solids, and then adding the remainder of the mash.

303,144.—Laundry bluing.—C. Franke.

Concentrated mixture of ultramarine, glucose and water.

303,146.—Composition of matter for the production of artificial slate.—H. Gallinowsky.

Burned bones, white lead and linseed oil.

303,213.—Compound for making bricks, artificial stone, &c.—II. A. Cooke.

Slaked lime, resin, sand, oxide of iron, gypsum and cement.

303,221.—Process of treatment of textile vegetable fibers.—E. Fremy and V. Urbain.

The fibers are boiled in an alkaline lye, the quantity of which is based upon an analysis of the fiber.

303,232.—Process of separating gold and silver from arsenide of iron.—E. Probert.

Consists in first melting the substance, tapping it out into pots lined with refractory material, and then introducing granulated litharge or lead into it while yet in a fluid state.

303,236.—Phosphorized alloy of copper and aluminium and process of making the same.—T. Shaw.

Aluminium from one-third of one per cent. to five per cent., phosphorus from one-twentieth of one per cent. to one per cent., and the remainder copper.

303,237.—Battery for generating electricity.—G. G. Skrivanow.

Contains a negative element coated or covered with chloride of silver, and having potassic or sodic caustic alkaline solution as the liquid in which the positive and negative elements are immersed.

August 12th, 1884.

303,277.—Apparatus for the manufacture of white lead.—G. H. Smith.

303,278.—Manufacture of white lead.—G. H. Smith.

Consists in submitting metallic lead while in a closed chamber to the corroding action of acid, vapor, and air introduced in regulated quantity and proportions under the conditions of temperature and outside pressure as set forth in the specification.

303,301.—Art of making artificial asphaltum from the residue of tanneries.—C. Lortzing.

303,335.—Azo-coloring matter.—A. Spiegel.

The new coloring matter, the bisulphite compound of dichlorphenolazo ethylbetanaphthol, the same being soluble in hot water, with a yellow color and when an alkali is added to this yellow solution or when it is boiled with a nitrate it is decomposed easily, and a bluish violet salt of the azo-coloring matter is precipitated.

303,371.—Manufacture of fertilizing materials.—F. L. Harris.

Saturates phosphates, &c., under pressure in a closed vessel with liquor extracted from animal substances.

303,376 —Process of purifying saccharine liquids.—O. H. Krause.

Extracts the sugar from the impurities retained in the bag filters by diluting the latter, adding lime, heating and then separating the sugar by means of filter presses.

303,378.—Bone black kiln.—F. O. Matthiessen.

A retort for a bone black kiln, composed essentially of an upper section, which is ventilated for the purpose of carrying off vapors and gases driven out of the bone black by preliminary application of heat, and a lower section composed of a group of vertical pipes, in which the bone black is subjected to a higher degree of heat, and is at the same time kept from contact with the air.

303,379.—Bone black kiln.—F. O. Matthiessen.

A series of retorts, each of which consists of a ventilated section, surmounting a heating section composed of a longitudinally corrugated pipe contained within a suitable heating chamber in combination with a circularly arranged group of cooling pipes beneath the heating chamber.

303,436.—Method of hardening or improving resins of all kinds.—A. Kissel.

Neutralizes the acids contained in the resins, resinous by-products, &c., with lime or other alkaline earths.

303,437.—Process of making ferrocyanides.—H. Kunheim.

Precipitates ferrocyanide of calcium from its solution by means of chloride of potassium for the production of ferrocyanide of potassium or other ferrocyanide.

303,443.—Process of washing raw sugar.—F. O. Matthiessen and G. Dinkle.

A series of mechanical operations for removing the greater part of the impurities from raw sugar in an economical manner.

303,456. Furnace for desulphurizing and deoxidizing ores.—J. H. Rae.

303,514.—Process of extracting cobalt from ores.—H. Herrenschmidt and M. Constable.

Consists in subjecting the pulverized ore to the action of finely divided sulphate of iron with water or heat or both, whereby the iron is converted into oxide and the cobalt into sulphate.

303,571.—Furnace for roasting zinc and other ores.—E. C. Hegeler.

303,586.—Furnace for reducing and smelting ores.—J. C. Newbery, J. L. Morley and B. Cleveland.

Reissue No. **10,507.**—Apparatus for extracting gold and silver from their ores.—R. Barker.

Original Patent No. 273,011 of February 27, 1883. An amalgamation process aided by electricity.

August 19th, 1884.

303,616.—Waterproofing starched fabic.—R. H. Buel and H. L. Brevoort.

The surfaced goods are treated with a solution of paraffine in benzine or naphtha, and afterwards subjected to heat to render them water repellent.

303,736.—Apparatus for distilling chloride of zinc.—A. Jamieson.

Not intelligible without the drawing.

303,776.—Process of defecating and clarifying saccharine liquors.—J. F. and O. Willcox.

Albumen solution is added, then dilute solution of acid, and the liquor heated to 190° Fahr. After this operation it is neutralized with lime, dilute acid in small quantity again added and the liquor filtered.

303,779.—Manufacture of white lead.—W. V. Wilson.

Converts part of the carbonate of lead in hydrated oxide of lead by treating the former with caustic potash.

303,913 and **303,915.**—Desiccating apparatus. H. B. De Witt.

309,914.—Apparatus for desiccating fertilizers.—H. B. De Witt.

303,980.—Art of treating and utilizing the refuse or waste products resulting from starch manufacture.—P. H. Grimm.

Adds the pressed finely divided nitrogenous residuum to the coarse refuse after the greater part of water has been pressed out of the latter.

303,962.—Method of obtaining carbonate of of magnesia.—A. Wünsche.

Forms ammonium magnesium carbonate by introducing ammonia and carbonic acid into a solution of a soluble magnesium salt. The double carbonate is then separated from the lye and worked up into carbonate of or caustic magnesia.   O. H. K.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

ANNUAL MEETING—December 5th, 1884.

Vice-President A. R. LEEDS in the chair.

Minutes of the November (7th) meeting were read and approved.

Minutes of the meeting of the Board of Directors (November 13th) were read.

The report of the Treasurer was read and accepted.

Messrs. Casamajor and Stebbins were appointed a committee to audit the Treasurer's accounts.

The report of the Committee on Papers and Publications was read and accepted.

The annual election of officers was then held.

Messrs. Pool and Rau were appointed tellers.

The following officers were elected for the year 1885:

President—J. C. BOOTH.

Vice-Presidents.

A. R. LEEDS.	ARNO BEHR.
A. A. BRENEMAN.	A. B. PRESCOTT.
H. ENDEMANN,	T. G. WORMLEY.

Corresponding Secretary—P. CASAMAJOR.

Recording Secretary—C. E. MUNSELL.

Treasurer—T. O'C. SLOANE.

Librarian—WILLIAM RUPP.

Curators.

A. C. HALE.	F. V. POOL.	M. LIEBSCHÜTZ.

Committee on Papers and Publications.

J. H. STEBBINS, JR.	A. A. BRENEMAN.

A. R. LEEDS.

Committee on Nominations.

J. B. MACINTOSH.	J. P. BATTERSHALL.
A. EIMER.	H. M. RAU.

A. P. HALLOCK.

Board of Directors.

A. R. LEEDS. ⎫

A. A. BRENEMAN, ⎬ *Three Local Vice-Presidents.*

H. ENDEMANN. ⎭

P. CASAMAJOR.   J. H. STEBBINS, JR.

C. E. MUNSELL.   E. WALLER.

T. O'C. SLOANE.   H. M. RAU.

WM. RUPP.   M. E. WALDSTEIN.

M. ALSBERG.   C. F. CHANDLER.

The following paper was read by title and ordered printed.

On the Spectroscopic Examination of Lauth's Violet and Methylene Blue, by J. H. Stebbins, Jr.

The following gentlemen were elected members:

Nathaniel Hathaway, New Bedford, Mass.

Charles A. Wittmack, Ph.D., P. O. Box, 1032, New York City.

The resignation of Clement Le Boutillier of Johnstown, Pa., was read and accepted.

The following gentlemen were proposed for election as members:

William Elliott. 197 Pearl street, New York City, proposed by W. Rupp, T. M. Hopke, C. E. Munsell.

Thomas M. Morgan, Crompton, Rhode Island, proposed by P. Casamajor A. A. Breneman, H. Endemann.

Dr. G. W. Lehmann, 57 S. Gay street, Baltimore, Md., proposed by A. R. Leeds, C. A. Doremus, J. H. Stebbins, Jr.

W French Smith, 235 Washington street, Boston, Mass., proposed by A. A. Breneman, C. E. Munsell, A. R. Leeds.

W. H. Kent, Ph.D., Jamestown, New York, proposed by A. A Breneman, J. H. Stebbins, Jr., W. Rupp.

E. H. Bartley, M.D., 401 Pacific street, Brooklyn, N. Y., proposed by A. A. Breneman, J. H. Stebbins, Jr., W. Rupp.

A. H. Van Sinderen, 45 William street, New York City, proposed by C. E. Munsell, W. Rupp, F. V. Pool.

Milton R. Wood, care Church & Co., Station G, Brooklyn, N. Y., proposed by J. H. Stebbins, Jr., T. O'C. Sloane, A. A. Breneman.

John T. Williams, East River Chemical Works, Cotton Exchange, New York, proposed by S. A. Goldschmidt, P. Casamajor, W. Rupp.

The following papers were announced for the January (2d) meeting:

On Camphor Motions, by P. Casamajor.

On Methods for Analysis of Indigo; Dr. H. M. Rau.

The meeting was then adjourned.

C. E. MUNSELL,

Recording Secretary.

ON THE SPECTROSCOPIC EXAMINATION OF LAUTH'S VIOLET AND METHYLENE BLUE.

By J. H. Stebbins, Jr.

For some time these two dyestuffs have attracted the attention of chemists, and several interesting papers on the subject have been published.

Up to the present however, nothing has been said concerning the optical properties of these two interesting bodies. It was, therefore, for the purpose of finding some simple method of detecting these coloring matters that the present investigation was undertaken.

Lauth's violet is produced by saturating a solution of para-phenylendiamine with H_2S, and then treating the mixture with an oxidizing agent, as Fe_2Cl_6. The coloring matter is precipitated with $NaCl$ and $ZnCl_2$ and then dried. It dissolves in water with a bluish violet color.

Methylene blue is produced by passing H_2S, into an aqueous solution of nitrosodimethylaniline chloride, until the yellow color of the latter has disappeared. This is a sign that the nitroso-compound has been reduced to the corresponding amido-compound. At the same time, also one of the hydrogen atoms is replaced by an atom of sulphur, thus giving rise to a thio-compound. This substance is then treated with Fe_2Cl_6, which oxidizes the body and forms methylene blue, which is precipitated from solution by means of $ZnCl_2$.

It dissolves in water with a deep greenish-blue color. It therefore seemed probable that the difference in shade between these two coloring matters would give rise to absorption bands, likewise differing from one another in proportion to the intensity and peculiarity of the color. This hypothesis was fully verified on experiment.

LAUTH'S VIOLET.

1 pt. Lauth's violet in 40,000 pts. of water, was found to be too deeply colored to show the absorption bands distinctly. On diluting this solution to 1 pt. in 400,000 pts. of water, a dark band extending from C 43–D 54 was observed.

The greatest absorption is located between C 46–D 51. (See *a* on the Diagram.) The same made alkaline with a drop of NH_4OH, shows a dark band, ranging from C 44–D 51.

The region of greatest absorption ranges from C 48–D 50. (See *b* on Diagram.)

The same acidified with a drop of HCl, gave a band ranging from C 43–D 52.   Greatest absorption from C 48–D 50.   (See *c* in Diagram.)

A rather curious phenomenon may be mentioned here. If a solution of the dyestuff be treated with a few drops of KOH and Ag NO_3 the solution turns reddish, and if it be now examined with the spectroscope, no absorption band whatever is seen.

METHYLENE BLUE.

1 pt. dissolved in 40,000 pts. of water, was found to be much too strongly colored to show the absorption bands.

1 pt. in 400,000 pts. of water shows a very dark band ranging from B 30–C 38, having its greatest absorbtion at B 32–C 36, and a very faint band to the right of this ranging from C 42= C 46. (See *e* in Diagram.)

No change in the position of the absorption bands is observable when the solution is acidified with HCl.

KOH and NH_4OH and Ag NO_3 likewise produce no change.

MIXTURE OF LAUTH'S VIOLET AND METHYLENE BLUE.

Equal parts of both solutions (1–400,000) were mixed and examined. Two distinct dark bands were observed, located respectively from B 31–C 35 and C 42–C 48.   (See *f* on Diagram.) If the above mixture be now treated with KOH, the violet color is cut out entirely, and nothing but the absorption band due to methylen blue is left. This is a very characteristic test for mixtures of both dyestuffs, as it is very sharp, and showing the reaction plainly in solutions of 1 pt. in 400,000 pts. of H_2O.

In this investigation the solutions were contained in square white glass bottles, having 4 cm. external diameter.
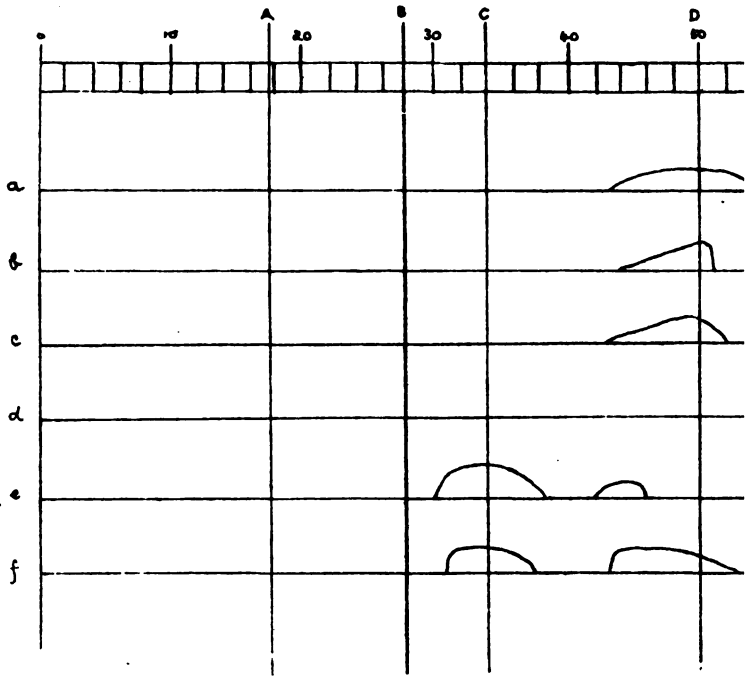
ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

A Redetermination of the Atomic Weight of Cerium.
H. ROBINSON.

The material used was a crude, yellow cerium sulphate obtained from Schuchardt, and contained much Di, together with La and other metals. Cerium was separated as basic sulphate, then converted into nitrate and peroxidized by Gibb's process (treatment with nitric acid and lead peroxide), washed, as basic nitrate, with dilute nitric acid, until it no longer yielded bands of Di in the spectroscope, and converted into chloride and finally into oxalate. The oxalate thus obtained, was heated in a current of HCl gas until completely converted into chloride, and this was finally titrated with standard solution of pure silver prepared by the method of Stas. The at. wt. of Ce thus obtained as the average of 7 determinations, after making necessary corrections, was 139.9035 (H = 1) or 140.2593 (O = 16). The ratios for at. wts. of H, O, Ag and Cl employed, were those of Stas.

Incidentally, it was found during the work that Ce may be quickly separated from Di and La, by evaporating the solution of the mixed nitrates to dryness, igniting over a naked flame until brown color disappears, and treating with boiling, dilute nitric acid, which leaves cerium undissolved as basic nitrate while Di and La go into solution. (*Chem. News, L. 251.*)　　　　A. A. B.

On Arsenotungstic Acid. By M. FREMERY.

Tungstate of barium, Ba, WO_4, was suspended in an aqueous solution of arsenic acid and decomposed with the theoretical amount of H_2SO_4, by a prolonged digestion on the water bath. The golden-yellow solution so obtained was concentrated in vacuo, and deposited the sulphate in the form of six-sided plates. These crystals are quite stable, and do not lose water of crystallization even over strong H_2SO_4. The specific gravity of the saturated solution at 16° C. is 3.279.

The composition of the ammonium salt is :

$$WO_3 \text{---------------------------------} 86.77 = 19.04$$
$$A_2O_5 \text{-------------------------------} 4.52 = 1.$$
$$(NH_4)_2O \text{-----------------------------} 3.08 = 3.02$$
$$H_2O \text{--------------------------------} 6.35 = 17.96$$

$$100.72$$

(*Ber d. chem. Gesell, 296, 1884.*)   J. H. S., jr.

On Solid Carbonic Acid. By H. LANDOLT.

The author recommends the use of crystallized carbonic acid for lecture experiments, etc. He prepares it in the form of small cylinders, and claims that in this form it may be kept for a long time exposed to the air. (*Ber. d. chem. Gesell, 309, 1884.*)

J. H. S., jr.

On the Hydrates of Cobaltous Chloride, and the Cause of the Difference in Color of this Salt. By A. POTILITZINE.

The change of color which this salt undergoes on being heated is due, according to the author's experiments, to a loss of crystal water, and not, as Bersh supposed, to the formation of an isomeric, twice hydrated cobaltous chloride. (*Ber. d. Chem. Gesell, 276, 1884.*)   J. H. S., jr.

ORGANIC CHEMISTRY.

Behavior of Pyrotartaric Acid with Bromine. C. BÖTTINGER. (*Ber. d. chem. Gesell, p. 317, '84.*)   J. H. S., JR.

On Chinoxaline. O. HINSBERG.

Bases similar to the chinolines, which instead of containing the pyridine ring, contain one composed of 4C and 2N atoms, have, up to the present time, only been prepared from cinnamic acid derivatives. Among these compounds belongs E. Fisher's ethylchinazole (I.).

I.

$$C$$

$$-C$$
$$-N$$

$$\dot{N}. C_2 H_5$$

II.

$$C_7 H_6 \diagdown \begin{matrix} N = C-OH \\ | \\ N = C-OH. \end{matrix}$$
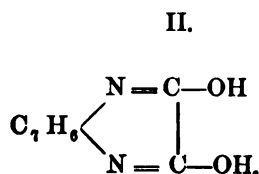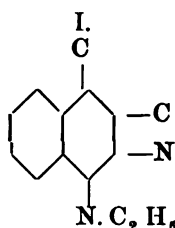
Closely allied to this is one produced by v. Richter, from diazo-propiolic acid, which he called oxycinnoline. Quite different from these, but allied to chinoline, is the condensation product which the author obtained from oxalic and m-p-toluylendiamine (II.).

It was hoped, by reducing this, to obtain a base free from oxygen. This, however, did not succeed. A new synthesis for producing this base was, however, discovered. It was found that these bodies are formed very easily by the action of aromatic diamines on gly-oxal.

$$C_6 H_4 \diagdown \begin{matrix} NH_2 \\ NH_2 \end{matrix} + \begin{matrix} C\ OH \\ | \\ C\ OH \end{matrix} = C_6 H_4 \diagdown \begin{matrix} N = CH \\ | \\ N = CH \end{matrix} + 2H_2O.$$
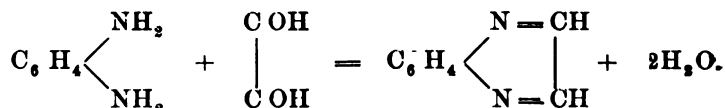
The derivatives of glyoxal also work very well, in fact all diketones which contain the group $-CO-CO-$ seem to produce the same result. Theoretical acids which have the carboxyl, and carbonyl adjacent to one another, combine likewise with ortho-diamines, to form monooxychinoxalines. Chinoxaline was obtained as a light yellow oil, boiling at 220-223° C. On cooling, it crystallized to a mass of white crystals, M. P. 27° C. It is easily

soluble in alcohol, ether, benzol and water. It forms salts with acids, which are nearly all very soluble in water. The oxalate is however, only sparingly soluble. (*Ber. d. chem. Gesell, 318, 1884.*)   J. H. S., JR.

Absorption Spectra of the Alkaloids. By W. N. HARTLEY.

An attempt to substitute physical measurements for the chemical and physiological tests now used to detect the alkaloids in medico-legal examinations. The substances were dissolved in diactinic solvents, generally alcohol, and measurements were made upon the photographed spectra taken by the light of an electric spark, from electrodes made of alloys of lead or tin with cadmium, concentrated upon the slit by a lens of quartz. The absorption spectra afford a ready means of ascertaining the purity of the specimens of the alkaloids, and practically of establishing their identity. In some cases quantitative estimations are possible. (*Chem. News, L. 287.*)   A. A. B.

Nitrating under Various Conditions. By E. NÖLTING and A. COLLIN.

In nitrating mono-substitution products of benzole, in which the position 1 is occupied by a basic group (NH_2), a neutral group (CH_3), the halogens, or a slightly acid group (OH), para-nitro and ortho-nitro compounds are formed, although the former predominate. The formation of meta-nitro- compounds, under these conditions, was rarely observed.

If, on the contrary, group 1 is an acid (NO_2, COOH, SO_3H, CN, COH, etc.), then meta-nitro- compounds are formed.

If the basic properties of the NH_2 group are neutralized, either by replacing one of its hydrogen atoms by an acid group, or combining it with a strong acid, as sulphuric acid, there are formed, according to Hübner, Frerichs, and Mears, besides ortho- and para-compounds, also meta- compounds.

The authors find that by nitrating in the presence of much sulphuric acid, that meta-nitro- derivatives may be formed exclusively. They also describe several ways of producing the para-nitro- compounds, which give very good results. Thus, for instance, to produce large quantities of para-nitro-acetanilide, one kilo. acetanilide is dissolved in 4 kilos. 66° B. sulphuric acid, and into this mixture is

then poured (1 mol.) 590 grm. HNO_3 of 1.478 Sp. Gr., or an equivalent amount of an acid of 1.4 Sp. Gr., which has been diluted with H_2SO_4 of 66°. During the whole operation the mixture must be cooled with salt and ice. (*Ber. d. chem. Gesell, 251, 1884.*)

<div align="right">J. H. S., jr.</div>

On Nitroorthotoluidine (M. P. 107°) and a few of its Derivatives. By E. NÖLTING and A. COLLIN.

By nitrating orthotoluidine in 10 pts. of sulphuric acid, a new nitroorthotoluidine (I.) is formed, having 107° as melting point. On reduction with tin and hydrochloric acid it forms meta-toluylen diamine (II.), melting at 98–99° C.

<div align="center">

I.

C_6H_3 $\Big\langle$ NH_2 (1.)
      CH_3 (2.)
      NO_2 (5.)

II.

C_6H_3 $\Big\langle$ NH_2 (1.)
      CH_3 (2.)
      NH_2 (5.)

</div>
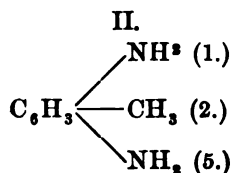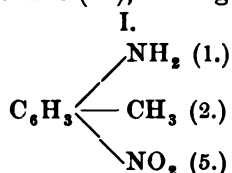
The nitroorthotoluidine crystallizes in monosymmetrical prisms, and at times in fine large crystals of a light yellow color. It is soluble in ether, alcohol, and acetone, but only sparingly soluble in water. It crystallizes best from ether, to which alcohol is added till a faint cloudiness appears. It tastes sweet. It is a weak base, combining with acids to form well characterised salts.

Nitroorthokresole, bromnitrokresole, amidokresole, and a coloring matter from metaamidokresole were then described. (*Ber. d. chem. Gesell, 268. 1884.*)

<div align="right">J. H. S., jr.</div>

ANALYTICAL CHEMISTRY.

Magnesium Hydrosulphide and its Use in Chemico-legal cases as a source of Hydrogen Sulphide. By E. DIVERS and T. SHIMIDZU.

Magnesium hydrosulphide, first introduced into the arts as a means of regenerating the sulphur of soda waste, is found by the authors to be an efficient source of pure H_2S. The solution is prepared by passing H_2S into water containing, in suspension, $\frac{1}{10}$ of its weight of commercial calcined MgO. The solution, when made, contains about 16 per cent. of $Mg S_2H_2$, and possesses a sp. gr. of 1.118 at 12° C., and readily yields 10 per cent. of H_2S by weight. It is nearly colorless and yields H_2S abundantly by heating to 60° C. Exposed to the air, it evolves H_2S slowly, and oxidizes at the surface, soon forming, however, a protective film. After the solution is exhausted it may be saturated with H_2S as before. Incidentally, the authors note that pyrrhotite may be used as a source of H_2S under action of acids, its only objection being contamination by CO_2 from native carbonates which accompany it. (*J. Ch. Soc., CCLXV., 699.*)   A. A. B.

Notes on Koettstorfer's Method of Butter Analysis. R. W. MOORE.

Among a number of vegetable oils examined, only cocoanut oil was found closely to approach Koettstorfer's limit as to the alkali equivalent of genuine butter. Mixtures of oleomargarine and cocoa oil were made which came within this limit (221.5 — 232.4 mgs. KHO pr. grm. of butter). A mixture of 53.1% cocoa oil and 46.9% oleomargarine required 223.6mgs. KOH pr. grm. The oleomargarine used required 193.5 mgs. KOH pr. grm. Cocoa oil yielded, by Hehner's method, 86.43% insoluble fatty acids.

Cocoa oil has been used to adulterate lard and butter. In the former case it would be easily detected (1 grm. lard = 195.5 mg. KOH), but *deodorized* cocoa oil, if it could be obtained, might be used in preparations of artificial butter and could only be detected by the method of Reichert. (*Chem. News, L. 268.*)   A. A. B.

Note on the Estimation of Iron by Potassium Permanganate in presence of HCl or Chlorides. J. Hood.

Magnesium sulphate is found to obviate the well-known difficulty presented here. No mention is made of the previous use of manganous sulphate by Zimmermann for the same purpose. (*Chem. News, L. 278.*)   A. A. B.

The Estimation of Alkalies in Silicates. T. M. Chatard.

Hempel's method for decomposition of silicates, (fusion with bismuth subnitrate), is improved by substitution of bismuth oxide for nitrate. Oxide and mineral, both in fine powder, are heated gradually to full redness in a platinum crucible, and kept at that temperature for 10–15 minutes; complete fusion is not necessary nor desirable. Acid silicates are preferably mixed with an equal weight of calcium carbonate, in addition, to prevent fusion. The mass, when cool, is heated in the water bath with somewhat dilute HCl. It dissolves rapidly. If only alkalies are to be determined, add ammonia and ammonium carbonate, filter, and separate magnesia in usual way. Results very good. (*Chem. News, L. 279.*)
                                                  A. A. B.

INDUSTRIAL CHEMISTRY.

On Japanese Tea and Tobacco. T. Takayama.

A description of the method by which tea and tobacco are cured and prepared for use in Japan, with analyses of eight samples of tea, together with two analyses of tea ash from green and black teas, respectively, and four analyses of tobacco.

The total ash in the teas varies between 4.73 and 6.00; nitrogen, 3.87 to 5.37; extract, 37.00 to 45.21.

The ash of black tea is notably richer in P_2O_5 and K_2O and poorer in CaO and SiO_2 than that of green tea. Determinations of theine, tannin and gum are also given. The analyses of tobacco include determinations of nicotine, water and ash, together with oxalic, citric, malic, acetic and pectic acids. Nicotine in the four samples

exists in the following proportions, per. ct., viz., 1.89, 2.45, 3.02, 3.92, and ash, 8.45, 9.80, 15.76, 20,71. Analyses of the ash of the four samples of tobacco are also given. (*Chem. News, L. 299.*)

<div align="right">A. A. B.</div>

On Japanese Camphor Oil. H. Oishi.

A description of the industrial preparation of camphor in Japan, from the wood of *Laurus Camphora*, together with an account of an examination of the camphor oil, a by-product condensing with the camphor carried over by steam from the apparatus in which the wood is treated.

The oil is a colorless liquid when purified, having Sp. Gr. .895 at 15° C., yields common camphor by oxidation, and is easily attacked by chlorine or sulphuric acid. Specific rotary power, 68.96°. A large number of fractions were obtained by distillation, and examination of several of these indicate that the oil is a complicated mixture of hydrocarbons of the terpene series with various oxidized hydrocarbons. The industrial value of the oil is demonstrated by the readiness with which it dissolves resins and mixes with drying oils. The compositions of several varnishes, made experimentally, is given. A solution of aluminium palmitate in the oil may be used for waterproofing paper, and the oil yields, on combustion with limited access of air, a fine lamp black, at a cost, apparently,which will make this use of it commercially practicable. The oil is produced in large quantities and is used in Japan as a lighting material. (*Chem. News, L. 275.*)

<div align="right">A. A. B.</div>

American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

August 26th, 1884.

804,044.—Manufacture of alkaline salts.—S. G. Thomas.

Decomposes alkaline chlorides and produces alkaline silicates and other non-haloid alkaline salts and hydrates, together with chlorine and hydrochloric acid, by acting on common salt in a Bessemer converter or Siemens or puddling furnace by means of the silicon contained in molten pig-iron in presence of oxygen of the air, oxide of iron, or other oxygen-yielding body.

804,088.—Process of bleaching cotton fabrics.—J. H. Engeler.

Exposes them to the vapor of chloroform under pressure and then dechlorinates them by exposure to a mixture of hydrogen, carbonic acid, and sulphuric ether.

804,108.—Manufacture of glucose or grape sugar.—A. Kayser.

Consists in neutralizing the converted material by a soluble sulphuride, and then purifying the neutralized liquid by passing an air current through the same.

804,128.—Method of purifying hard water.—G. H. Nott.

Precipitates bicarbonates and carbonic acid by passing the whole of the water over lime and then filtering.

804,147.—Treating cotton seed to remove fibre.—T. Taylor.

Subjects the moistened fibres and hulls to the action of a spray of strong sulphuric acid.

804,260.—Process of obtaining ammonia from ammonium sulphate.—E. Carey, H. Gaskell, Jr., and F. Hurter.

Subjects ammonium sulphate in conjunction with sodium sulphate to an elevated temperature so as to obtain ammonia and sodium bisulphate.

804,263.—Cream-tester.—W. L. Edson.

September 2d, 1884.

804,303.—Applying natural gas to glass furnaces.—J. Dornan and C. N. Brady.

804,333.—Apparatus for recovering copperas.—J. Lyons.
Not intelligible without the specification.

804,341.—Purification of brine.—E. A. Mebus.
Heats it and adds an alkaline hydrate and carbonate.

804,360.—Composition for preserving meats.—J. Ross.
Chromic acid, nitrate of potassium and water.

804,361.—Explosive preparation made from gun cotton.—J. Schulhof.
Gun cotton impregnated with fat, compressed and coated with collodion.
804,446.—Compressing-pump for ammonia gas.—A. Osenbrück.

804,500.—Manufacture of solidified compound metals.—F. E. Canda.

A mixture or compound of two or more ground, pulverized, granulated or otherwise divided metals, or of two or more alloys, or of one or more metals with one or more alloys, solid at ordinary temperature, mixed in any desired proportion, such mixture or compound being in a loose form or condition.

804,607.—Apparatus for the emulsion of milk and fat by centrifugal force. —C. C. Burmeister.

804,644.—Apparatus for separating cream from milk.—W. Homer.   •
Not intelligible without the drawing.

804,785.—Apparatus for preserving beer.—J. F. Kausler.
Impregnates the air used for compressing with alcoholic vapor.

804,773.—Process of purifying iron and steel.—J. E. Atwood.
Infuses an amalgam of mercury and lead into either melted pig, cast, scrap or wrought iron or steel, or combinations thereof.

804,775.—Composition to be used as a substitute for hard india-rubber, celluloid, iron and the like.—S. Barbier and C. H. Coiffier.
Mixture of ivory waste or dust and horn agglomerated by means of albumen.

804,902.—Process of manufacturing paints.—R. M. Breinig.
Soap combined with a pigment dried and mixed with oil.

804,910.—Treatment of flax in the retting or steeping process.—R. H. Callyer.
Boils the flax straw in a saponaceous solution containing oxalate of ammonia, then washes and presses it.

804,911.—Fine and waterproof paint.—C. W. Colony.
Coal tar, pulverized stone or slate, salt, red or white lead, alum, Venetian red, asbestos, resin and linseed oil.

805,031.—Separation of zinc from galenas carrying silver and metallic oxides and sulphides.—P. B. Wilson.
Treats the ore with an acid to dissolve the zinc and to generate hydrogen sulphide, with the latter he precipitates, in another vessel, the dissolved lead and silver and then separates the zinc solution from the precipitates.

September 16th, 1884.

805,056.—Apparatus for distilling or reducing oils.—R. Dean.

805,057.—Process of dyeing hair.—C. A. C. de Barbaran.
An ammoniacal solution of nickel and pyrogallic acid.

805,097.—Apparatus for treating refuse from oil refineries.—H. McManus.

805,123.—Compound for axle-bearings.—I. P. Wendell.
Silicate of soda, asbestos, sulphur and a lubricant.

805,155.—Dye-vat.—J. P. Delahunty.

805,174.—Composition for rendering wood, &c., incombustible.—L. Gimenez and J. Trigoyen.

Infusion of bark of the holly, salt, zinc sulphate, ammonium chloride, alum and fish glue or isinglass.

305,180.—Method of dividing and distilling crude petroleum.—H. Halvorson.

Divides crude petroleum into two parts, designated primary and secondary oils, which process consists in mixing together crude petroleum and benzine, and volatilizing the latter, whereby it is caused to carry over with it the primary oil, leaving the secondary oil behind. The secondary oil is then subjected to fractional distillation, after adding a small quantity of sulphuric acid.

305,181.—Mode of preparing lubricating oils obtained from petroleum.—H. Halvorson.

The "primary oil" mentioned above is mixed with amylic alcohol; ethylic alcohol is added to the mixture until opalescence takes place, whereupon the mixture of alcohol and lighter petroleum constituents are removed.

305.182.—Apparatus for distributing crude petroleum.—H. Halvorson.

305,184.—Substitute for caoutchouc.—J. J. Haug.

Boils skins and glycerine under pressure, mixes the mass so obtained with glycerine and chromate of potash or other suitable salt, acted upon by light, with or without the addition of ground cork, ox gall and color.

305,192.—Solution for refining copper and separating gold, &c., from copper.—J. S. Howard.

A solution for the decomposition of copper and copper or other ores, consisting of potassium, bisulphate, hydrofluoric acid, sulphuric acid, sodium nitrate, and water.

The bath containing the above solution yields an electric current which may be employed in a plating bath.

305,201.—Manufacture of Portland cement.—R. W. Leslie.

Combines lime or lime and magnesia with slate, calcines the compound to a clinker and subsequently grinds it.

305,224.—Apparatus for the extraction of oils and fatty matters from animal, vegetable and mineral substances.—N. A. Pratt and G. W. Benson.

Consists in extracting by means of percolation and diffusion of chemical solvents in or through the mass while the same is under mechanical pressure.

305,249.—Method of treating phosphates for fertilizers.—T. B. Stillman and A. H. Koefoed.

Rocks containing insoluble phosphates are mixed with dolomite or limestone and roasted, and the pulverized mixture is subsequently treated with a mineral acid and water.

305,312.—Process of dyeing black.—D. Jamieson.

For cotton, linen jute or silk, whereby fast colors are secured in black, drab, or slate shades, consisting of the separate and successive steps of dyeing in indigo blue and in a solution of cutch or gambier, the two latter separately or combined, the solution having cupric sulphate mixed therein, followed by passing the goods so treated through a solution of potassium chromate.

305,329.—Apparatus for distilling low wines.—N. Peterson and H. Sommer, Jr.

305.386.—Incrustation preventative.—A. A. Rosenberg.

Consists of a mixture of raw potatoes, sweet peeled chestnuts, and common washed or soaked peas.

305,389.—Process of making chrome-red.—C. E. Hore.

Consists in mixing "sublimed lead" with a solution of potassium bichromate and an alkali, boiling the mixture, and finally separating the insoluble pigment from the soluble product.

305,390.—Process of making lemon-chrome.—C. E. Hore.

Consists in mixing "sublimed lead" with nitric acid, then adding thereto potassium chromate, stirring the mass and finally separating the insoluble color from the soluble products.

305,391.—Process of making chrome-yellow.—C. E. Hore.

Consists in mixing "sublimed lead" with a solution of potassium bichromate, boiling the mixture, and finally separating the insoluble coloring matter from the soluble products.

Reissue No. 10,522.—Refrigerating and ice making apparatus.—C. P. G. Linde.

Original No. 228,364, dated June 1, 1880.

September 23d, 1884.

305,423—Antiseptic compound.—S. Cabot, Jr.

An insecticide compound consisting of resin dissolved in a solution of an alkaline sulphide, holding in solution crude naphthalene.

305,510.—Gas making apparatus.—J. Carroll.

Oil is heated by passage through pipes in a steam heated chamber on its way to the gas generator.

305,524.—Process for the manufacture of acetates directly from metallic ores.—J. A. Mathieu.

Sprinkles the ground ore with acetic acid, exposes the sprinkled ore to the air, separates the salt thus formed by the addition of water, then exposes the residual ore to the action of acetic acid vapors. The solutions so obtained are evaporated and crystallized.

305,579.—Preparing a vegetable size for use in textile manufactures.—V. Ducancel and E. Fortin.

Consists in dissolving a farinaceous substance in cold water, then adding thereto a solution of an alkali in a proper proportion to free the sizing matter, and then adding thereto an acid in sufficient quantity to neutralize the alkali.

305,681.—Apparatus for evaporating alkaline solutions.—J. P. R. Polk.

A vacuum pan connected with a calcining furnace.

305,686.—Varnish.—J. A. Shephard.

Kauri gum, beeswax, turpentine and linseed oil.

305,708.—Method of protecting unslaked lime during transportation.—J. W. Ormsby.

Protects the lime contained in a car from air and moisture by placing a cover of flexible and impervious material over it and then spreading a layer of sand or analogous material over the cover.

305,719.—Apparatus for washing gas.—J. Somerville.

September 30th, 1884.

305,737.—Electrolytic liquid for secondary batteries.—W. E. Case.
Zinc sulphate and magnesium oxide.

305,758.—Manufacture of hydraulic cement.—R. W. Leslie.

Mixes quick-setting cement rocks and ferruginous earths or stones and then calcining and subsequently grinding the same to a powder.

305,754.—Manufacture of Portland Cement.—R. W. Leslie and D. Griffiths.

Consists in combining with lime, or lime and magnesia in any of their forms, iron slag or cinder and subsequently calcining said compound to a clinker and grinding the same.

305,789.—Oxidizing and chloridizing furnace.—J. B. Brett.

305,828.—Manufacture of anhydrous caustic baryta.—C. Marchand and V. M. Picabia.

Consists in subjecting the barium nitrate in a close vessel to the action of gases heated to a high temperature so as to affect the disassociation of the oxide of nitrogen from the baryta.

305,846.—Process of working auriferous and argentiferous arsenides and arsenides and sulphides.—E. Probert.

Consists in introducing litharge or lead into the fused material contained in pots or vessels lined with some moistened refractory material, and also containg limestone, dolomite, or other mineral carbonate in the lining, or distinct therefrom, whereby the charge is stirred by means of the action of the molten mass upon the lining of and mineral substance in the pot.

305,970.—Manufacture of hydraulic cement.—S. H. Short.

Limestone containing clay and magnesia is mixed with marl, silica and alkaline carbonates, then formed into bricks and heated to the melting point of cast iron.

306,040.—Apparatus for purifying air and gases.—F. Windhausen.

Air or gases are forced by centrifugal force through a spray of water and against a thin sheet thereof upon the inner surface of a revolving cylinder, the water being sprayed and forced out by an inner perforated cylinder. The impurities are carried off by the water through a sealed trap.

Reissue No. 10,528.—Paint.—J. A. Shephard.
Red lead, glycerine, linseed oil, japan and turpentine.

O. H. K.

ERRATA.

p. 36, 8th line from top, for "actions and others," read "acetones and ethers."

p. 77, 2nd line from bottom, for "Ba Co," read "Ba CO_3."

p. 130, 2nd line from top, for "properties," read, "proportions."

p. 136, 9th line from bottom, for "dejected," read, "digested."

p. 170, 7th and 15th lines from top, for "nitrate," read, "nitrite."

p. 190, 9th line from top, for "found," read, "formed."

p. 232, 2nd title, after "atmospheric," read "pressure."

p. 237, 2nd title, for "Thörner," read "Koerner."

p. 245, 10th line from top, for "tetrochloride," read "tetrachloride."

p. 262, 5th line from top, for "This residue resolved readily and in water," read, "This residue dissolved readily in water."

p. 266, 9th line from bottom, for "XVI. Height of infant," read, "XVI. Weight of infant."

p. 269. In table, 16th line from top, for 9.00, read 0.00 ; 17th line from top, for 80.08, read 83.21 ; for 83.21, read 89.08.

p. 271, 7th line from top, for 1.0026, read 1.026 ; 10th line from top, for 1034, read 1.034.

p. 279, 19th line from top, for "constition," read "constitution ;' 21st line from top, after "manner," add: "But as to any fixed and definite relation governing the proportion of the constituents to each other, or to the sum total of the solid constituents, the graphic chart thus far has failed to afford a satisfactory indication."

p. 283, 4th line from top, for "smelting," read "melting."

The Journal

— OF THE —

AMERICAN CHEMICAL SOCIETY.

VOLUME VII.

1885.

INDEX OF AUTHORS.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING, held January 2d, 1885.

Meeting called to order at 8.30 P.M.; Dr. A. R. Leeds in the Chair.

The minutes of the meeting of December 5th, 1884, were read and approved.

REGULAR MEMBERS ELECTED.

William Elliott, 197 Pearl St., New York.

Thomas M. Morgan, Crompton, Rhode Island.

Dr. G. W. Lehmann, 57 S. Gay St., Baltimore, Md.

W. French Smith, 235 Washington St., Boston, Mass.

Walter H. Kent, Ph.D., Jamestown, New York.

Elias H. Bartley, M.D., 401 Pacific St., Brooklyn, N. Y.

A. Howard Van Sinderen, Ph.B., 45 William St., New York.

Milton R. Wood, care of Church & Co., Station G., Brooklyn, N. Y.

John T. Williams, East River Chemical Works, Cotton Exchange, Hanover Square, New York.

NOMINATIONS FOR REGULAR MEMBERSHIP.

Dr. A. Miller Jacobs, 92 New Church St., New York City.

Joseph Little, Passaic, N. J.

Edward K. Dunham, Ph.B., 93 Boylston St., Boston, Mass.

A paper by Dr. J. C. Booth, on Graphite or Black Lead Crucibles (2d paper), was read by title.

Dr. H. M. Rau read a paper on methods of Indigo Analysis.

Mr. P. Casamajor read some further notes on the Motions of Camphor on Water; being a continuation of a paper on the same subject read before the Society October 4th, 1877.

Mr. F. V. Pool described a new form of Dropping Flask.

Mr. Casamajor presented a note on Oil of Malt, by Narcisse, Pigeon.

Dr. Waller drew attention to the notice in the *Chemical News* of Dec. 5, relating to the family of Henry Watts.

Mr. Casamajor suggested that the article be reprinted and distributed with the next issue of the JOURNAL.

Dr. Waller was requested by the Society to take charge of subscriptions which might be received in response to this notice.

The Meeting was adjourned at 10.30 P. M.

C. E. MUNSELL, Recording Secretary.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY

Meeting ... ... P. M., Dr. A. R. Leeds in the Chair.

The minutes ... ... of December 7th, 1888, were read and approved.

Meeting ... ... of January 11, 1889

William E. ... ... New York.

Thomas M. M. ...

Dr. G. W. ... ... Baltimore, Md.

W. Fra. ... ... Mass.

Walter H. X. ... ... New York.

Elias H. ... M.D. ... N. Y.

A. Howard ... Ph.D. ... New York.

Milton R. W. ... ... N. Y.

John T. W. ... ... Hanover Square, New York.

Dr. A. M. ... New ...

Joseph Little, Pa... N. J.

Edward K. D... Ph.D. ... Boston, Mass.

A paper by Dr. ... (2d paper), was read ...

Dr. H. M. R... a paper ... Analysis.

Mr. P. C... ... Camphor on Water ... subject read ...

Mr. F. V. P... ...

Mr. C... ... Pigeon.

Dr. Wa... ... of Dec. 5, ... Henry W...

Mr. C... ... tribute d with ...

Dr. W... ... scriptions ...

The Meeting was adjourned at 10.30 P. M.

C. R. MI...ELL, R...

TREASURER'S REPORT.

JANUARY 8th, 1885.

DR.					CR.					
1884.					1884.					
Jan.	1	To cash on hand	$198 91		Jan.	31.	By Bills Paid___	$199 75		
Jan.	31.	To collections___	110 00		Feb.	29.	" " ___	5 00		
Feb.	29.	" ___	89 50		March 31.		" " ___	235 21		
March 31.		" ___	264 50		April	30.	" " ___	137 32		
April	30.	" ___	191 00		May	31.	" . " ___	209 06		
May	31.	" ___	44 97		June	30.	" " ___	101 34		
June	30.	" ___	180 50		July	31.	" " ___	193 79		
July	31.	" ___	176 00		Aug.	31.	" " ___	111 75		
Aug.	31.	" ___	48 00		Sept.	30.	" " ___	3 42		
Sept.	30.	" ___	10 00		Oct.	31.	" " ___	87 50		
Oct.	31.	" ___	75 00		Nov.	30.	" " ___	118 73		
Nov.	30.	" ___	192 50		Dec.	31.	" " ___	152 68		
Dec.	31.	" ___	113 00							
			$1,698 88							
							Balance	$138 33		
1885.										
Jan. 1.		To Cash on hand__	$138 33					$1,693 88		

DETAILED STATEMENT OF EXPENDITURES.

Treasurer's expenses	$30 10
Recording Secretary's expenses	54 00
Corresponding Secretary's expenses	20 50
Librarian's expenses	21 05
Rent, Janitor, and Coal	450 75
Journal	964 17
Insurance	6 00
Gas	8 98
	$1,555 55

DETAILED STATEMENT OF RECEIPTS.

Dues collected from members	$1,146 11
Advertisements	153 00
Subscriptions to Journal	44 36
Extra numbers of Journal	31 50
Donations—William Weightman	50 00
Jas. C. Booth	50 00
Albert R. Leeds	20 00
	$1,404 97

COMPARISON BETWEEN YEARS 1883 AND 1884.

	1883.	1884.
Receipts	$898 20	$1,494 97
Expenditures	832 21.	1,555 55
Excess of receipts over expenditures	66 81	
Deficiency		61 58

Respectfully submitted,

T. O'CONOR SLOANE,

Treasurer.

THE MANUFACTURE OF BLACK LEAD CRUCIBLES.

By James C. Booth, Ph. D.

[Concluded from Page 283, Volume VI.]

Pulverizing the Graphite.—The manner of grinding graphite being of considerable influence on the quality of the crucible, some details upon the subject will be proper and useful. The larger masses of graphite being roughly broken by hammer into smaller pieces, the whole mixture of pieces and fine stuff is fed into an ordinary bark mill, consisting of two cast iron inverted cones, the smaller with iron teeth on its outer surface, revolving inside the larger one, similarly armed on its inner surface. The lumps are caught and crushed between these cones, and the resulting coarse and fine powder, being immediately passed between ordinary mill stones, is ground to a more uniform and finer powder, which is then assorted by sieves into finer and coarser portions, the latter being again ground and sifted until the requisite fineness is attained.

I have nothing to suggest to improve the machinery or mode of grinding, but as I differ from crucible makers in regard to the degree of fineness, I here present my views and the reasons for them. To economize time the ground graphite, passing through the sieves and consisting of fine flour on one extreme and on the other of flakes that can be split by a knife or ground to thinner scales, is usually mixed directly with the wet clay.

I regard the coarser flakes of insufficiently ground graphite as positively objectionable, because they lessen the strength of the crucible, which is the supreme consideration. I have often observed the surfaces of spalls split off from a crucible while in use, and noticed on them graphite scales of $\frac{1}{4}$ inch or more in diameter, with a part of the same scales remaining on the crucible and in the same spot. The knife easily separated more scales from the corresponding locality on spall and crucible. The facility of splitting offered by these graphite scales increases the facility with which pieces of the crucible itself split off through the feebly adhering laminations of the graphite. I have often seen a half dozen such scaling plates of graphite on a spalled surface of 2 to 4 square inches, and instantly read the cause of spalling and of serious injury to the crucible. If those coarser and thicker plates of graphite had been

ground, spalling would not have occurred. Graphite is a very feeble substance in the plane of its lamination but strongly resists a force at right angles to this plane, and, what is more extraordinary, it will do so at a white heat.

Hence black lead should be ground exceedingly fine, not leaving a plate of it more than $\frac{1}{20}$ to $\frac{1}{60}$ inch in diameter. I have tried crucibles made of black lead powder that would not quite pass through a 126 wire sieve, and found them excellent. The dust that passed through such a sieve consisted of about 75 pr. ct. of good and tough flakes, and 25 pr. ct. of a fine black powder, without apparent structure, consisting of siliceous sand* and iron pyrites. "If fine grinding were adopted," the economic manufacturer asks, "What should be done with the fine powder passing the 125 wire sieve?" About $\frac{1}{8}$ of it, being siliceous, is not hurtful, but the $\frac{1}{8}$ iron pyrites is injurious, and although it is so exceeding small in quantity, yet it would be preferable to utilize it in one of three ways : 1. To separate it by a still finer sieve into good flaky graphite, to be used with the rest, and dirt, to be thrown away ; or, 2. To use it in mixture with good material for covers, etc.; or 3. To sell the whole mass passing the 125 sieve, with other inferior residues, for stove blacking, &c. In such case it may sell for half the value of good black lead.

Clay.—Admirable as are the qualities of black lead to resist the action of a white heat, burning off as it does only partially and with some difficulty, it must, in order to hold melted metal, be held firmly in the crucible shape given to it and this is effected by clay, that when wet mixes easily with the powdered black lead, and when dried and burned holds it rigidly and at the same time resists the highest white heat of the furnace. A clay from Klingenburg in the Palatinate seems to be pre-eminently adapted for such crucibles, and I strongly advise employing exclusively the best quality, every lump of which has the Government stamp impressed on it.

I have tried lower grades of the Klingenburg, and some of our own clays (Amboy, &c.), but I have found none to combine the excellent qualities of the best Klingenburg. In its wet state it is superlatively plastic, and free from every trace of grit, and in this state can be blended most intimately with the fine scales of black lead. It is barely fusible by itself at a white heat, and

when mixed with an equal quantity of graphitic scales, as in the crucible mass, it only softens at a white heat so far as to surround each scale, which it holds immovably in its place, while the equal quantity of scales prevents any further fusion, even when kept for 10 or more hours at the highest white heat. Viewed chemically, Klingenburg clay is a hydrated silicate, containing in round numbers about $\frac{2}{3}$ alumina, $\frac{1}{6}$ water, and the balance silica, with minute quantities of oxide of iron, and alkaline fluxing matter. In its employment for fire crucibles, the only consideration is its content of $\frac{1}{6}$ water when calculating the weights of the ingredients.

Sand.—The third constituent of the graphite crucible is a rather coarse siliceous sand that will stand a high heat without flying into fine powder. Its action is mechanical, causing a more uniform air drying, previous to burning, so as to avoid cracking, and playing the limited part of a skeleton to maintain the shape of the crucible. A good infusible clay, hardened by burning, and broken and sifted as a coarse sand, was found to act as well as sand, but not perceptibly better.

Mixture for Crucibles.—The only point of agreement in the composition of the best crucibles seems to be that when burned they should contain over 50 pr. ct. carbon, as determined by analysis. The formula may vary within rather wide limits, but our experience with good crucibles of the best makers and with our own, indicated that the burned crucible should show 55 pr. ct. carbon on analysis. In calculating the quantity of black lead used in a crucible from the determination of carbon, it is only safe to add 6 pr. ct. for the siliceous sand and pyrites found in the black lead. Some of the choicest black lead grains now in commerce have scarcely 1 pr. ct. of foreign matter, so entirely has the earthly constituent of plants or the small percentage of ash in anthracite disappeared from the mineral graphite. The proportions of black lead, air dried clay and sand used by different makers, and by the same maker at different times, vary considerably, but the following is given as illustrating approximately the composition for making the convenient amount of about 2,000 lbs. of crucible mixture when burned. As a crucible maker, I prefer the weight of black lead to be 1,100 lbs., so that the burned clay and sand

may together make up about 1,000 lbs., which will give the 55 pr. ct. carbon in the burned crucible:

Black Lead.	Air Dry Clay.	Sand.	Total, when burned.
1,100	1,000	120	2,100
1,100	950	160	1,996
1,100	900	200	1,990

Every manufacturer prefers such composition as, in his judgment, works best in practice.

Mixing.—The air-dried clay of a given weight for a batch of crucibles, after being roughly broken by hammer, is covered with water, and after being softened, by standing, to a thin paste, receives the due proportions of the finely ground and sifted black lead and sand, and is then partially incorporated by a shovel. Some makers, ambitious of reputation for quality, judiciously pass their hands through the incorporated mixture to detect and remove lumps of gravel of pyrites or quartz. No amount of hand or shovel mixing can equal or supersede the operations of the Mixer or Dolly-tub, a wooden vat of 4 or 5 ft. diameter and height, standing on end, to which the somewhat stiff pasty mass is transferred. Its simple machinery is a vertical shaft, revolving on the centre of the bottom, and provided with a series of horizontal knives, arranged at a distance from each other spirally, and extending nearly to the sides of the tub. The revolving knives, having their blades at a slight angle to the plane of revolution, cut the putty-like mass into separate strips which fall over the sloping blades, and again unite in neat layers, to be again cut, separated, reunited, in new positions. After thus working for some time a slide on the outside of the tub, near the bottom, is drawn and the blades slope in such a direction to their revolution that they pass the mass downwards and out of the sliding door. The protruding masses are cut off and thrown in above, and this operation, often repeated, has the effect of blending the whole into a stiff paste of absolutely uniform composition, so that each flake of the graphite, $\frac{1}{1000}$ inch diameter, is enveloped in plastic clay, and every particle of clay is in contact with a flake. The wonderful strength of the black lead crucible is due to this microscopic blending of graphite and clay.

To make the crucible still more perfect the finished mass of about a ton in weight should be laid by in a damp cellar, covered with cloths, and occasionally moistened. In spite of the restless and reckless driving of our American manufacturers, they recognize that in all clay wares, the ready-mixed masses kept for a long time make better wares than those freshly squeezed out of the Dolly tub. The experience of the Chinese for ages in making the finest clay wares, led a potter to accumulate a quantity of mixed batches, ready for use, during ten, twenty-five and more years, to be used by his son, grandson, etc., as in the case of some that had been similarly bequeathed to him.

Can this part of the manufacture of graphite crucibles, i. e., making the dough, be improved? I offer the two following suggestions for consideration : 1. Scarcely any native clay is wholly free from occasional lumps of iron pyrites, which, happening to become located in the side of a crucible, might ruin the metal near it, or make a hole for the metal to escape, and in either case injure the reputation of the maker. Careful makers sometimes feel for such in the soft clay mass, but why may not this mass be passed between rollers of very small diameter, which would not pass the small gravel or lumps, but accumulate them on the feeding plate? If such arrangement will pay in brick or terra cotta ware, surely the costly crucible mass would bear it. 2. The roughly mixed crucible mass, made very liquid with water, might be passed through rotating sieves, of smaller meshes than the sand, and the slip evaporated to proper consistence on shallow furnaces similar to those employed in drying white lead. These suggestions can only be answered by the crucible maker on the ground of perfection of work, and economy.

Moulding.—All graphite crucibles, between Nos. 30 and 80, embracing those for steel, brass, silver, etc., are formed on plaster molds, centered on the potter's table, or throwing lathe. The weighed mass for a crucible, being repeatedly cut and " slapped," is pressed into the bottom of the mold, which shapes the outside of the crucible, and while rapidly revolving, a steel or iron profile of the interior is gradually lowered into the mass, which is thus pressed against the sides and raised to the top of the mold by revolution, and gives the form of the interior of the crucible. This re-

volving method, like the ancient potter's throwing lathe, is far more important in this art, because it effectually disposes every scale of graphite, tangentially to the cylindrical or conical walls of the crucible, not merely on the inside and outside, but throughout the whole mass. Here lies the great strength of the graphite crucible. It is a mass of strong scales of carbon, that will not break at right angles to their lamination, being rigidly held in their sheet-like disposal by burnt clay, that will not yield to any heat. It is a graphite crucible, infusible and unalterable, where the black lead is very much, and for a long time, prevented from burning away by its envelope of clay. It is a clay crucible, which will not soften in the highest ten-hour, white heat employed in the arts, and will endure ten times the roughest usage of any other material, except bar iron. For many years I employed excellent wrought iron crucibles for melting silver, but find that black lead crucibles are better adapted to the purpose.

The proposition to make a cheaper graphite crucible by merely pressing out the soft crucible mass in molds, without the loss of time in revolving, would utterly fail for lack of the strength of structure given by revolution. It like manner the suggested substitution of anthracite, or any other form of carbon, for graphite, would signally fail to approximate to the strength and other qualities of a black lead crucible.

Drying is effected by keeping the formed crucibles in the plaster molds for a time, and then ranging them on shelves in warm, dry air, most economically in the spaces around the upper half of the burning kiln. If dried too rapidly, or if frost be allowed to enter the drying-room, fine cracks, like crooked hair lines, barely visible, around the interior, indicate that the crucible should be remade from the foundation.

Burning.—The crucibles must be thoroughly burned, and yet so as to avoid burning out black lead, their chief source of strength and value. To attain this object they are burned in seggars, which more or less exclude air, using two seggars for each crucible, one inverted over the other, and yet graphite is sometimes partly burned out by the air entering between them. This has been partially obviated, by some makers, by smearing the joint on the outside with clay slip. Another method which I invented,

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on the outside with clay slip. Another method which I invented,

but never put into practice, as I soon after gave up the manufacture, consisted in replacing the oxygen of the air in the crucible and seggar with carbonic acid. I proposed to effect this by putting a small quantity of anthracite, or of rather dry bitumous coal, around the inner part of the lower seggar, and also, if practicable, a little of the same inside the crucible itself, avoiding defacing scratches or marks, which would be suspicious in the eyes of a buyer. I still suggest this idea to the manufacturer, for as long as there is present an easier burning carbon than graphite, the former will be attacked to the safety of the latter; and, moreover, the carbonic acid formed and forming from the coal, excludes the oxygen of the air, or the latter is consumed immediately on entering. A dry gaseous coal that neither puffs nor melts would be best for this purpose.

To secure equal and uniform distribution of heat, the furnace should have, and usually has, many openings as firing hearths around its base, and when the burning is nearly complete, these should be more or less closed, so as to prevent the entrance of more air than is barely necessary to maintain the diminishing combustion while the furnace is beginning to cool. This is another method of preventing the loss of black lead, and, with the same object, the entrance of air from above downwards should be prevented or counteracted.

The amount of carelessness or ignorance, or lack of attention to prevent burning out black lead and possibly impairing the strength of a crucible, may be readily ascertained on the burned ware. When the outside of a crucible has the usual black lead color, it is either not burned enough, and then quite soft to the nail or knife, or it is extremely well burned, to be determined also by hardness under knife or nail, or it may have received the outside cleanly operation of a brush, which is, of course, only outside, and condemnatory. An outside drab color, which is the prevailing one, indicates burning off black lead. If the drab color be very shallow and show the subjacent black by friction of the finger, then it is well burned, like the greater part of the crucibles in commerce. Even if a slight scratch with a knife show the black immediately under the outside, it still shows excellent burning. But if it require a little digging into the drab before coming to the black lead,

say ¼ inch, I should be disposed to throw off one-fourth, or more, of its value. If it go to a half inch, I should reject such a crucible as worthless, because a large proportion of its life, its strength, has been burned out.

Use and Life of Black Lead Crucibles.—The most extensive use of black lead crucibles is to melt blistered steel and cast it into any desired form, whence it is termed cast-steel. Tens of thousands of crucibles are weekly employed for this purpose, the amount of steel at each melt being 75 to 90 pounds, and a number of such melts constituting a day's work. Hence the great multiplication of furnaces, or of crucibles in a gas furnace, when 1,000 pounds or more are cast at a time. The life of a crucible for melting steel varies with the nature of the steel to be cast. If it be a highly carbonized (fine) steel, a moderate white heat will soon melt it, and the crucible may be repeatedly used. If a low (common) steel be employed, approximating to bar-iron, such as a locomotive driving wheel, the crucible has to endure five (5) and more hours of the most intense white heat for a single casting, and yet it can endure several such meltings. A crucible will bear repeated meltings of tool steel, and in order to extend its life, the outside is often coated with a good clay slip, with or without an admixture of black lead, after each melt. The wonderful protective power of the clay, embracing each particle of black lead, shows the advantage of grinding the black lead to great fineness, making clay and graphite mutually protective. In melting steel, the melter has to consider the length of the time of melting, and, therefore, the quantity of additional carbon the steel is assuming from the black lead pot, which excess he neutralizes by adding a certain quantity of scraps of bar-iron to the melt.

To show other possible applications of the crucible mass I may mention that syphons have been constructed of it, and successfully employed for transferring melted cast-iron from one vessel to another.

Black lead crucibles are also extensively employed in melting brass, bronze, German silver, gold and silver. I here add a few data in relation to the last two metals. The crucibles employed at the U. S. Mint, at Philadelphia, are so called No. 70 pots, of three gallons capacity—being 9 inches in diameter at the top and 13

inches deep, both inside measurement. The walls are 1 inch thick at top, and 1½—2 inches at bottom. In such a crucible we usually melt at once, every 1½ hours, 5,400 ounces of standard gold ($\frac{9}{16}$ pure), or 370 pounds, avoirdupois; four melts, a moderate day's work, equal, therefore, 1,480 pounds, or 21,600 ounces. The value of such a single melt is over $100,000. One such crucible is run for four days with full confidence in its safety, and fearing no fracture or loss of gold; for although we have run them for six (6) days it is found the economy does not balance the possible danger of fracture and leaking. Taking the safe run of four days, we melt in a single crucible, with scarcely any loss, $1,600,000 worth of gold at the crucible cost of about $2.50.

We usually melt 3,500 ounces (=240 pounds, avoirdupois,) of standard silver in a crucible (No. 70) at one melt, and cast six such melts, without undue haste, in a day, making 1,440 pounds, or 21,000 ounces. Since it is safe to estimate its life at five days, we melt in one such crucible before it is laid aside 7,200 pounds (=105,000 ounces) of standard silver, or about the same amount in dollar value. This, however, is not all of its life, but only its manhood, for after doing duty for so long a time in perfect health, it is put aside to purify and toughen inferior silver and to gather into melts grains and residues, otherwise wandering off, for some time before it is thoroughly disabled and ground to powder, to recover the precious grains which it has concealed in its body.

To one who knows the ease with which alkalies attack clay at a high heat, and how readily fusing nitre will burn off carbon, even black lead, it is quite a surprise to witness the wonderful durability of the black lead crucible, when in its nearly worn-out condition it is used for fluxing residues, and we can only attribute its strength to the minute and intimate blending of clay and graphite, mutually resisting destruction.

No doubt the life of these crucibles is prolonged in melting bronze, brass, &c., because they are so tough through the blending of clay and graphite that they rarely break suddenly, but rather give notice of their intention to do so by gradually opening, and even then not until they have been worn thin by long use.

Some years ago I prepared some black lead crucibles with more than usual care in order to test their life. We made from 40 melts

of silver, the lowest limit, to 60 melts, the higher limit, in a single crucible. I have no doubt that a careful study of the principles of the manufacture of black lead crucibles here developed, somewhat fully, and even perchance their further development, beyond my conception, can improve their quality so as to double the life and strength ascribed to them.

U. S. MINT, PHILADELPHIA, Dec. 31, 1884.

NOTE ON CAMPHOR MOTIONS.

BY P. CASAMAJOR.

On the 4th of October, 1877, I read a paper " On the Motions of Camphor on the Surface of Water," before the American Chemical Society, in which I described experiments, which had led me to the conclusion that these motions were due to electricity.

The extraordinary motions which give an appearance of life to pieces of camphor, swimming on the surface of water, are not to be seen at all times. Very often camphor will remain motionless, while at other times the pieces gyrate with great animation. One of the earliest observers of these singular motions, Romien (1748), came to the conclusion that they were due to electricity, while subsequent investigators, among whom may be counted the great Volta, have generally decided that there is no connection between electricity and the motion of camphor on water.

I was led to believe that camphor motions were due to electricity by the results of experiments, of which I will give a brief account.

When pieces of camphor are thrown on water, they may remain torpid or they may gyrate with every appearance of life. In the latter case, the motions, may be instantly arrested by dipping a finger in the water on which the camphor moves. If we have pieces of camphor lying quietly on water, they may be made to move by dipping into the water a rod of either glass, sealing wax or vulcanite, electrified by friction. After every immersion the glass is to be dried by wiping with a dry cloth or a piece of bibulous paper ; and, before every immersion, the rod is electrified by rubbing with a piece of silk or flannel. After one or more immersions of the electrified rod, the camphor motions invariably start, and by a few additional immersions they increase in intensity. The fact that these

motions could be started by means of an electrified rod was a new
one.   Those who had decided that camphor motions were not due
to electricity were not acquainted with it, and I was led to believe
by this fact, and by others which I gave at the time, that camphor
motions were electrical phenomena.   There was, however, some-
thing unsatisfactory in this method of applying electricity to the
water on which pieces of camphor floated, but, at that time, no other
method occurred to me.   Afterwards the whole subject slipped
from my mind, but, quite recently, the following experiment has
suggested itself, which seems to show that camphor motions are
not due to the state of electrical tension of the liquid on which
pieces of camphor float.

The experiment was performed in a glass dish about two inches
deep, and of five inches diameter.   This was filled with water up
to within an inch of the top.   The bottom of the dish and the sides,
up to within an inch of the top, were covered with tin foil.   A me-
tallic wire dipped in the water of the dish, with one end out of the
water, but having no connection with the outside lining of tin foil.

This glass dish was the equivalent of a Leyden jar, which could
be charged with electricity from the plate of an electrophorus by
touching the wire dipping into the water with this plate, laying a
finger at the same time on the outside armature.

A few pieces of camphor were placed upon the water in the dish,
and these were reduced to immobility by dipping a finger in the
water.   After this the water in the dish was charged with elec-
tricity by repeatedly placing the plate of an electrophorus in con-
tact with the wire dipping into the water, while the outside
armature was touched with a finger.

There was no effect produced on the pieces of camphor floating
on the water of the dish.   These remained motionless, not exhibit-
ing the slightest tremor.   There could be no doubt that the water
surface was in a greater state of electrical tension in this experiment
than when the water is electrified by dipping an excited rod in it,
for, by placing one hand on the outside armature of the dish, and
slowly approaching the water surface with a finger of the other
‘ hand, a perceptible spark was obtained.

There seems to be a discrepancy between the results to be ob-
tained in these two classes of experiments.

By dipping an electrified rod successively in water the camphor motions always take place, while, when we electrify by applying the plate of an electrophorus to the water in the dish, as described, not the least tremor can be perceived. As these results were obtained over and over again, there cannot be any doubt as to the difference of the effects in the two modes of operating.

The conclusion that may be drawn is that camphor motions are not caused by electricity. In the case of an electrified rod, dipped successively in water, I am inclined to the opinion that electricity acts indirectly by removing physical impurities from the surface of the water, as shown by the following experiment :

Take a glass of water, and on its surface place a few pieces of camphor. If these are inclined to move, they may be stopped by dipping a finger in the water. Then blow a cloud of lycopodium powder over the surface of the water, so as to cover this surface uniformly with the powder. If now an electrified rod is dipped repeatedly in the water, wiping it dry after every immersion, and, rubbing it with a piece of flannel before dipping in the water again, the result will be that the pieces of camphor will move as if gifted with life. It will be noticed at the same time that the surface of the water will be almost entirely free from lycopodium, as the powder has been gradually removed by each successive immersion of the electrified rod, which attracts lycopodium like all other light bodies. If now we suppose that films of oily matter are removed in the same way by an electrified rod, we may conceive how electricity can act indirectly in removing impurities from the surface of the water.

There would remain to explain why films of oily matter or other impurities act as a check on camphor motions while a physically clean water surface is a favorable condition in producing these motions. Towards the solution of these questions I will venture the following explanation, which may serve as the base of further researches.

It is a well ascertained fact relating to camphor motions, that when these motions take place the camphor dissolves in water more quickly than when the camphor is at rest. I think that a connection exists between camphor motions and the three following facts :

1st, that camphor dissolves in water quite easily at times ; 2d,

that its density allows it to float on water ; and 3d, that the so-
lution has a density slightly different from that of water. I am not
prepared at present to develop these ideas, which would require
further experiments to establish.

I will confine myself to the well ascertained fact that a piece of
camphor wears away much faster when in motion than when at
rest. This being established, it appears more than probable that
if a piece of camphor is perfectly free from oily matter it will dis-
solve in water more readily than if protected by a greasy film. The
slightest film of this nature, in contact with camphor, becomes a
saturated oily solution of camphor, and if any excess exists, over
what will cover the camphor, the greasy film will extend over the
surface of the water.

When things are in this condition, if an electrified rod is dipped
several times in the water, every immersion will remove a portion
of oily film from the surface, until finally the film on each piece of
camphor becomes so thin that the water reaches the pieces of cam-
phor, and these immediately become gifted with motion.

ON THE METHODS OF INDIGO TESTING.
By Henry M. Rau, Ph. D.

It appears strange, when the high price of indigo and its large
consumption in the industrial arts are considered, that the methods
commonly employed in this country for its valuation should, from
a scientific standpoint, be so crude and inaccurate.

Taking the average price of the various grades of indigo in the
market as a basis for calculation, it may be stated that a single per
cent. of indigotine represents, to the consumer, from two to two
and one-half cents for each pound of goods purchased.

Under these circumstances it would seem highly desirable to em-
ploy tests as accurate as possible, even though these should not be
as time-saving as the greater number of commercial tests.

Nevertheless, it is a fact, that the ordinary indigo "analyses" are
so wide of reliable results, that guess work might quite as well be
substituted for them, and this in face of the fact that we have in
the gravimetric determination by the reduction methods, a means
for a closer valuation of indigo than can be applied in the case of
almost any other dyestuff.

The ordinary mode of judging the quality of an indigo and by which it is commonly bought and sold, is quite superficial ; and even in experienced hands allows but a rude estimate of its value. The buyer or broker takes a cake of indigo, breaks it with a knife, and compares it with another of previously known worth as to color, density, hardness, etc. Upon these points of comparison he relies for a correct valuation.

Where a formal analysis is required, the oxidation tests are usually employed ; and it is to the inadequacy of these that I particularly desire to call attention. They are based upon the oxidation of the sulpho acid of indigotine in aqueous solution by a variety of agents, with the destruction of the blue color. The different processes in use employ potassium permanganate, potassium bichromate, bleaching powder, or nitric acid, as the case may be. The sample of indigo is dissolved in strong sulphuric acid and the solution brought to a certain volume by the addition of water. A measured quantity is then decolorized with an oxidizing solution which has been standardized upon pure indigotine or some indigo of known value. When the blue color of the indigotine solution has been destroyed and been replaced by a yellow or ochreous shade, the oxidation is complete and the volume of the reagent solution employed, is noted. Now, if indigo contained merely the coloring principle, indigotine, in mixture with inorganic matters, this voluumetric estimation would be both practical and reliable, but as its various other ingredients (which are entirely valueless) also enter into the reaction and consume a quantity of the reagent, the method gives these useless matters the same value as the indigotine. The figures obtained are, therefore, always too high, and that in no uniform ratio, but varying with the amount and character of the accompanying impurities. The color which the latter themselves impart to the solution also renders it very difficult to determine exactly when the requisite quantity of the re-agent has been added.

The reason why these methods, although known to be so faulty, have been retained in general practice, is to be found in the high figures obtained by them, which are to the apparent advantage of the dealer. Their scientific appearance also is calculated to impress the unskilled. They are, in reality, anything but scientific. A good Bengal indigo which actually contained 52.5% indigotine, showed

72.5% when tested by the permangate process, a Kurpah of 41.8%
(with a larger proportion of organic impurities) by the same test
yielded 69.2%. Using potassium bichromate as the oxidizing agent,
the figures obtained were nearly the same. In fact, in order to
achieve correct results by any of these methods, it would be neces-
sary to determine previously the precise amount of extraneous or-
ganic matter accompanying the coloring principle.

I have recently adopted for the analysis of indigo a very con-
venient modification of Fritsche's reduction test, which is also
sufficiently rapid to permit as many as three determinations to be
made together within twenty-four hours. I proceed as follows :
From 1½ to 2 grammes of the sample, in very fine powder, are carefully
weighed and placed in an 8 oz. Erlenmeyer flask (A). The flask is
provided with a doubly perforated rubber stopper, through which
passes a bent glass tube (B) provided with a stop-cock and reaching
just below the stopper, and a second tube (C) of syphon shape which
passes nearly to the bottom of the flask and terminates in a small
funnel.
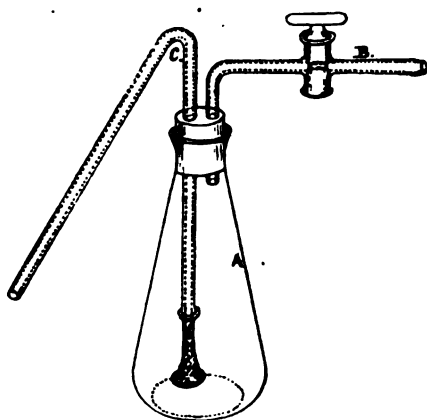
In this funnel is placed a
wad of glass-wool. Tubes
and stoppers must fit air-
tight into the flask. The
apparatus is accurately
tared ; from three to four
grammes of pure grape su-
gar in small pieces are then
placed in the flask, fifteen to
twenty c. c. of a 40%. caus-
tic soda solution, sixty c. c.
of water, and sufficient 90%.
alcohol (120 c. c.) to bring
the whole to about seven
fluid ounces, are added. The apparatus is then weighed a second
time, so that by deducting the tare of the flask, etc., we obtain the
weight of the total contents. A small piece of rubber tubing closed
with a pinch cork, is slipped over the syphon tube, the stop-cock is
closed, and the flask heated on a water bath for twenty-five to thirty
minutes. At short intervals the stop-cock is quickly opened and

closed, to relieve the pressure of the alcohol vapors, the flask being occasionally shaken. The indigo readily dissolves, the liquid assuming a deep yellow color, the insoluble substances settling clearly to the bottom. The solution being completed,·the flask is allowed to stand for about an hour, and is then connected with a generator of carbon dioxide gas.

The clear liquid is quickly run off, as far as possible, through the syphon tube, the glass wad retaining any floating particles, and the flask is again weighed quickly, whereby the weight of the liquid thus run off is ascertained. This portion is placed in a beaker glass and a stream of carbon dioxide gas passed through the same for fifteen minutes, causing the indigotine and indirubine to precipitate in crystalline flakes. A current of air is then drawn through, which completes the precipitation. The precipitate, which by this means is obtained in beautiful copper-colored flaky crystals, is collected upon a previously dried and weighed filter, washed repeatedly with boiling water, then with hot dilute hydrochloric acid and finally, with water. Precipitate and filter are then dried at 110% C., and lastly weighed. Deducting the weight of the filter, the indigotine and indirubine contained in that portion of the liquid treated as described, are obtained, and by a simple calculation the percentage contained in the whole sample is ascertained.

The advantages of this process are found in the fact, that the insoluble impurities in the indigo are readily deposited, thereby avoiding the tedious filtration of the liquor, and that the indigotine and indirubine are obtained in a crystalline precipitate which is easily purified by washing.

Schunk has stated (Lit. Phil. Soc., Man. XIV.) that where he employed small quantities of indigo, as compared to the quantities of alcohol, caustic soda and grape sugar, Fritsche's process occasionally yielded him very incorrect results, the indigotine at times not precipitating at all. However this may be, the results which I have obtained by this method have been surprisingly uniform. Thus a sample of artificial indigotine, prepared from propiolic acid, tested 99.96%.; two analyses of pure dry indigotine from indigo showed 99.68%. and 99.74%.; three estimates of a high type Bengal indigo gave 60.35%., 60.78%. and 60.72%.

Few analytical methods can claim greater uniformity than this.

A NEW FORM OF DROPPING FLASK.

By F. V. Pool.

It is often convenient in methods of titration in the laboratory to make use of a flask or bottle from which the standard solution can be poured or dropped and the amount of solution which has been used, determined by weighing the flask or bottle of liquid before and after the operation. This method has several advantages over the ordinary volumetric one in which a burette is used, the first advantage being that of using the liquid at any ordinary temperature without making a correction for the difference between that temperature and the one at which the liquid was standardized, provided, of course, that the standardizing was made with the flask and not with a burette.

This is due to the simple fact that a gramme of water or any other liquid *weighs* the same, no matter whether the temperature be 15° C. or 20° C., and if, in process of standardizing, for example, a solution of $AgNO_3$, it is found that one gramme of the solution is equivalent to one milligramme (.001 grm.) of Cl, we may use the solution (by weight) afterwards at the same temperature or any other temperature ordinarily found in the laboratory without making any correction for the same. This is not the case in using an ordinary burette and reading off the *volume* taken, for here we must make use of a table of corrections for temperature, which would give us for a range of 10° C.—say, between 25° C. and 15° C., a difference of .2 of 1% of the strength. That is to say, if 100 c.c. of the said solution are equivalent to .100 grm. of Cl, at 25° C. the same *volume* of the liquid at 15° C. would be equivalent to .1002 Cl. Of course this applies to all burettes which record the volume of liquid taken.

In the second place the dropping flask has an advantage over burettes which require the use of a pinchcock and rubber tube, inasmuch as we may employ in the flask a solution such as permanganate of potash or chromic acid which would act injuriously upon the rubber tube and become itself decomposed. To obviate this difficulty in the use of burettes, recourse is had to glass stopcocks, which are expensive and not always perfect. They are also liable to stick very tightly if allowed to remain for some time in contact with K HO or Na HO solution.

The Gay Lussac and Bink burettes are not open to the second

objection, but they are attended with a difficulty which is peculiarly
their own, namely, the retention of a drop of the solution at the
end of the dropping tube by capillary attraction and the preven-
tion of the free delivery of the contents of the burette.

Analysts have overcome this difficulty by inserting a stopper,
provided with a glass tube and rubber mouth tube, into the top of
the burette and expelling the refractory drop with the breath.
This procedure answers very well, but there is
a somewhat neater way as we shall see further
on. The dropping flasks in use at the present-
day are few in kind and very simple, being
nothing but small flasks of varying capacity
provided with a top or side tube and open to
the objection which is found in using the bu-
rettes of Gay Lussac and Bink. The flask here
shown is an improvement upon existing forms,
and has been used for some time in the labor-
atory and with a great deal of satisfaction.
It consists of a light, flat-bottomed flask of a size determined by
the capacity of the balance upon which it is to be weighed.
From one side, near the bottom, a narrow tube starts and reaches
up a little higher than the body of the flask, being then turned
outward like the side tube of Gay Lussac's burette, which it
resembles. In the neck of the flask a small hole is blown which,
during the operation of dropping, is governed by the thumb
of the manipulator. Into the neck of the flask a rubber stop-
per is fitted and through this stopper a short thistle-tube is
passed, the upper part of the latter being covered by a piece of
thin sheet rubber, securely fastened by a piece of thread. The
flask being filled with the standard solution is first counterpoised
on the balance. It is then grasped around the neck, the thumb
being placed very near the small hole in the side and the forefinger
held just over the rubber membrane on the top.

The flask is then tipped so as to deliver the solution through the
side tube, the rapidity of flow being governed by the thumb,
which closes the small hole in the neck at will. If at any time
during the operation a drop is formed at the end of the tube, it
can easily be forced out or drawn back into the flask by the control

of the thumb and forefinger. By this means any amount of delivery may be obtained from part of a drop (by touching the end of the tube to the stirring rod) to a steady stream.

After a sufficient quantity of the solution has been used, its weight is determined by replacing the flask upon the balance pan and adding weights to balance the counterpoise in the other pan. In our own laboratory we use for this purpose a balance whose capacity is 500 grammes in each pan, and a counterpoise consisting of a small pasteboard box partly filled with shot. With this it is the work of only a few seconds to counterbalance the flask, and after the titration is completed, the amount of solution used is quickly ascertained by the above method of leaving the counterpoise as it was and adding weights to the pan containing the flask. The capacity of the latter is about 250 c.c. and one filling suffices for several operations, the counterpoise being changed each time by removing some of the shot.

The convenience of this modified volumetric method can be appreciated by those who usually have a number of determinations of one kind to make in a day, and it will recommend itself to all on account of the ease of manipulation, accuracy, and slight cost of the apparatus.

The adaptation of the above described contrivance to a Gay Lussac burette, is obvious. All that is necessary is to adapt a rubber stopper and thistle-tube to the burette, and to blow or drill a small hole into the side of the burette about an inch from the top.

The flasks used were made by William Baetz, 96 Fulton Street, New York.

NOTE ON OIL OF MALT.

By Narcisse Pigeon. (Abstract.)

Beer is properly manufactured from malt and hops, barley being the grain usually employed in making malt. None of the substitutes for barley malt, contain the characteristic oil of malt and lack therefore the proper taste and aroma. Oil of malt has been found by the author in the radicles or rootlets of barley malt, and he suggests its extraction as a proper substance for developing the taste which is lacking in beer made from the above-mentioned substances.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

On Nitrification.—PART III. R. WARRINGTON.

A summary of results obtained at Rothamstead during the last few years in continuance of previous work.   Nitrification is produced by an organism which the author now believes to be a bacterium. The evidence that an organism is the agent in nitrification is now so strong, that the burden of proof is thrown upon those who deny the statement. The process may be started at will in any suitable solution by addition of a nitrified material, while such solutions, unseeded, remain sterile for years. Phosphoric acid is essential to the continuance of the process as it is to the existence of life. The range of temperature within which nitrification is possible, is the same as that which limits the vitality of low organisms, and the process requires presence of the plant food suited to such organisms.   Antiseptics are fatal to nitrification ; a temperature of 100° C. is also fatal. The process may be permanently arrested in sewage, by boiling, if introduction of foreign matter be subsequently prevented, but is started at will, after boiling, by the introduction of a nitrified solution.   Finally, the theory that nitrification in the soil is due to condensation of gases in the pores of a soil by which an exceptionally active oxidation is brought about, is overthrown by Schloesing's experiments, which show that such gases occupy normal volumes.

All of the Rothamstead experiments of this series were made with solutions.   Those most commonly employed contained ammonium chloride, 80 ; sodium potassiums tartrate, 80 ; potassium phosphate, 40 ; and magnesium sulphate, 20 ; the numbers representing mgms. per litre.   Calcium carbonate or gypsum, or in some cases, tricalcium phosphate, was added.   Diluted urine, (4 c.c. per litre) was also used.   All the solutions were sterilized by heating to near 100° C. for 6–8 hours, and then seeded with natural soil or a nitrified solution.

The nitrifying power of the soil at different depths was determined by taking samples of earth, with proper precautions, from the side of an excavation in a cultivated field, at stated depths from

the surface, down to nine feet. The organisms in question are shown to exist mainly within nine inches of the surface in a clay soil, rarely extending below 18 inches, and never, so far as these experiments show, below three feet.

All nitrogenous substances which yield ammonia by the action of organisms in the soil, are nitrifiable. Nitrification is limited by excessive alkalinity of the medium as has been shown by others. Under given conditions, an alkalinity equal to 160–200 mgms. of disodium carbonate per litre was favorable to the process, while 320 mgms. or more proved unfavorable. Strong urine is, therefore, unfit for nitrification, a fact which has an important bearing upon the use of liquid manures. Apart from alkalinity, also, concentration of ammoniacal solutions has an influence upon nitrification.

The rate at which nitrification proceeds depends also upon the vigor of the organism, which, in turn, rests upon the conditions of nutrition, access of oxygen, etc., in its previous development and in its ancestry. Depth of solution, connected as it is with access of oxygen, has an important influence upon nitrification. In porous soil the process is much more favored in respect to oxygen than it can possibly be in solutions. Organic carbon is essential only as it is required for the nourishment of the organism, and excess is rather prejudicial, because it tends to appropriate a part of the necessary oxygen. Urine contains sufficient organic carbon for its own nitrification. Nitrification may go on slowly at temperatures as low as 3.2° C.

When a fresh sample of nitrified soil is added to a nitrifying solution, the first effect is a reduction of nitrates, already present, to ammonia. This reduction runs its course more quickly than the subsequent nitrification; it is accompanied by turbidity of the solution, and has been shown by Dehérain and Maquenne to be caused by bacteria.

As to the theory of oxidation of ammonia to nitric acid in the human body, the author has made direct experiments, in which the absolute quantity of nitric nitrogen eliminated in equal times was determined, while stated quantities of ammonia salts were taken into the system. The results lend no support to a belief in such oxidation of ammonia.   A. A. B.

On Germination in a Soil Rich in Organic Matters, but Free from Microbes.   E. Duclaux.

The destruction of the organic matter of soils by microbes, and the production on such soils of new vegetation are phenomena which always occur together.   Hence the inquiry whether plants can develop in the absence of microscopical organisms.   In other words, could the plant, without such organisms, utilize the organic matters left in the soil by preceding plants ?   This problem depends on this other problem.   If a seed is sown in a soil rich in organic matter, but free from microbes, can it utilize manure placed in this soil ?

Among substances which can be offered to a seed as manure, the author has chosen milk, which contains a carbohydrate, milk sugar, and a nitrogenous substance, caseine.   The author has previously shown that milk is only assimilated by animals after treatment by two ferments—rennet and casease.

The author operated on two seeds, peas and beans.   These were freed from microscopical organisms and planted in a sterilized soil moistened with sterilized milk.

At the end of two months, the milk remains unchanged—it has not been coagulated and its caseine can be precipitated by acids.

With solutions of rock candy and with starch paste, analogous results have been obtained.   The plants produced from seeds in such conditions are exactly as if grown in pure distilled water.   The weight of each plant is less than that of the seed from which it grew.

In presenting the above paper, M. Pasteur made the following remarks :

" Often in our laboratory conversitions, I have called the attention of young scientists to the interesting results which would be obtained by feeding a young animal, from its birth, with substances pure from microscopical organisms.   If I undertook this study it would be with the expectation that life, under such conditions, would not be possible.   If such experiments were undertaken it would be well to try the influence on digestion of the addition of any particular microbe or of an association of known microbes of various kinds.   Hen's eggs would afford a very convenient agent for such experiments.   The egg should be deprived of all living

dust, at the moment when the chick is to appear. This should be
placed in a space free from germs. The air should be renewed in
this space, but all the air introduced should be freed from germs.
All the food introduced should also be freed from germs (water,
milk, seed.) The result of this experiment may either confirm
my preconceived ideas, or it may show that life is not prevented,
or that it takes place even more actively than usual. At any rate,
the result obtained would be interesting." (*Comptes Rend.* 10:), *66*.)

<div align="right">P. C.</div>

An Explanation of Gladstone and Tribe's "2-3 Law in Chemical Dynamics." J. W. LANGLEY.

"In a paper by Gladstone and Tribe on "A Law in Chemical
Dynamics" (*Jour. Chem. Soc. 1871, p. 1123*), it is stated that, if
a plate of metal be suspended in a solution of a salt of another
metal which it precipitates, the percentage of salt in solution will
be to the rate of chemical action as the powers of 2 to the corre-
sponding powers of 3. This is the "2-3 law" referred to, and it
has been found to hold good for solutions of 3 per cent. or less.
No explanation of it has been given, and the author of the present
paper has sought to distinguish between the chemical and physical
elements of the problem, and to define the value of each. To test
the influence of the products of chemical action upon the rate and
continuance of that action the suspended plate (of copper, in a solu-
tion of silver nitrate) was slightly curved and made to revolve in
the solution so as to present fresh portions continually to the action
of the plate and thus to give the effect of more rapid removal of
the solution of copper than was effected by gravitation in the case
of the stationary plate. The experiment was varied also by the
use of a revolving brush which swept one surface of the stationary
plate (the other surface being varnished) at a uniform speed, and by
revolving the precipitating vessel itself in a vertical plane at such a
rate that the tendency to remove the products of chemical action from
the plate was 30 times that of gravity. The results show that the rate
of action is dependent both upon the strength of the salt solution
and upon the rate at which the products of chemical action are re-
moved from the surface of the plate. As the stronger solution
produces more rapid action it yields also a denser product, which

falls away more rapidly, and, for given conditions, within the limits of the original experiment, the law can be shown to be a necessary result. That this is true only for conditions in which gravity effects the removal of the products of chemical action from the plate, is demonstrated by the departure from the law in the case of the centrifugal experiment. The whole question is one relating to the influence of mass upon chemical action. The author concludes that the true law of chemical action in such cases as this "should be that the time during which one atom replaces another is constant and that the total chemical action varies directly as the mass of the reacting body in solution.—(*Jour. Chem. Soc.*, **265**, *633*).

<div align="right">A. A. B.</div>

The Use of Boiling Oxygen as a Means of Cooling, and the Solidification of Nitrogen. S. V. WROBLEWSKI.

Oxygen does not solidify when brought to boiling by sudden release from pressure. It leaves, however, a crystalline precipitate upon the bottom of the containing vessel or any object plunged in it. Further research is needed to decide whether these are oxygen crystals or the impurities in the gas. This deposition of crystals interferes somewhat with its use for cooling. A second obstacle is the necessity for using very strong, closed vessels. Only the moment of violent boiling when the pressure is removed can be utilized. This is of very short duration and presents another obstacle. The temperature of boiling oxygen, measured by a thermo-electric method, was 186° C. As yet nitrogen only has been cooled in this way successfully. It solidifies and falls in flakes which consist of crystals of notable size. (*Jour. f. prakt. Chem.*, **29**, *95*.)

<div align="right">F. P. V.</div>

Solubility of Solid Bodies in Water at Different Temperatures. J. L. ANDREAS.

The solubilities of some of the commoner solids, determined by distinguished experimentors, show decided differences. The author points out certain courses of error, as proper shaking, regulation of temperature, inaccurate thermometers, and purity of solid. In a series of experiments he seeks to avoid these errors, determining the solubility of sodium chloride, potassium sulphate and potassium nitrate. (*Jour. f. prakt. Chem.*, **29**, *456*.)

<div align="right">F. P. V.</div>

Modifications of Sodium Sulphate. S. U. PICKERING.

From the discrepancies in existing data relating to the heat of solution of metallic sulphates, the author was led to suspect the existence of modications of the same sulphate, and the present paper is an attempt to show that anhydrous sodium sulphate exists in at least two different conditions. The molecular heat of solution for samples prepared by drying the effloresced, crystalline salt at different temperatures is approximately constant for samples dried at or below 150° C.; dried between 150° and 200° C. the salt shows a remarkable rise in heat of solution, reaching, however, at temperatures somewhat above 200°, a value which is constant up to the fusing point. The discrepancies in the results of Berthelot and Thomsen may have resulted from the use of mixtures containing different proportions of the two modifications. The heat of solution of the fused salt presents anomalies which require further investigation. (*J. Ch. Soc.*, **265**, *686.*)   A. A. B.

The Origin of Calcium Thiosulphate. E. DIVERS.

The action of the atmosphere upon calcium polysulphides (decomposition of soda waste) involves no direct oxidation of sulphur, but a splitting up of these compounds by hydrolysis into sulphur, H_2S and lime. H_2S is then oxidized only in respect to its hydrogen, the free sulphur reacting upon calcium hydrate to produce calcium thiosulphate and hydrosulphide.

$$3 CaH_2O_2 + 12S = CaS_2O_3 + 2CaS_5HOH.$$
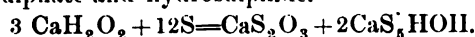
By dissecting this reaction, however, it may be shown to involve a preliminary reaction in which SO_2 is set free. The union of calcium sulphite and S to produce thiosulphate is a well known reaction and as the one other method of obtaining thiosulphate (the action of SO_2 on a hydrosulphide) involves a similar reaction, the author concludes that the origin of the thiosulphate in all cases rests upon one common reaction, viz.: *the union of sulphur with calcium sulphite.* (*J. Ch. Soc.*, **265**, *696.*)   A. A. B.

ORGANIC CHEMISTRY.

On Uric Acid. E. FISHER.

Uric acid methyl-ether on being treated with phosphoric chloride loses two atoms of hydrogen and two of oxygen which are replaced by two Cl atoms, thus :

$$CH_3 - C_5N_4H_3O_3 + 2PCl_5 = 2HCl + 2POCl_3 + CH_3 - C_5N_4$$
$$HO\ Cl_2.$$
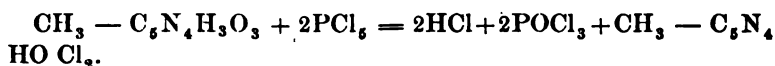
In this chloride one hydrogen atom may be replaced by CH_3 and moreover, the two chloride atoms by H, etc. By prolonged treatment with $P\ Cl_5$, the compound $CH_3 - C_5N_4HO\ Cl_2$, loses H and O again, and is converted into the tri-chloride $CH_3 - C_5N_4$ Cl_3. In this, as in the previous compound, the Cl atoms may be replaced by various radicals.

The author regards these compounds as derivatives of the hitherto unknown hydrogen compound $CH_3 - C_5N_4H_3$, which he calls methylpurine. Among the compounds enumerated are the following : Dichloroxymethylpurine, trichlormethylpurine, oxymethylpurine, dichloroxydimethylpurine, oxydimethylpurine, ethoxychloroxydimethylpurine, dioxydimethylpurine, diethoxydimethylpurine, trioxydimethylpurine. (*Ber. d. chem. Gesell,* **328,** *1884.*)   J. H. S., Jr.

On the Presence of an Isocyanide (Carbylamine) in the Lighter Portions of Commercial Benzol. E. NOELTING.

These light distillates, known techincally as "heads," have been shown by different investigators to contain carbon disulphide, crotonylene, amylene, hexylene, ethylic alcohol and acetonitrile or methyl cyanide, in addition to more or less benzol. The author has noticed the odor of an isocyanide in this product and finds on examination that this odor disappears on treatment with HCl, giving place to the odor of CS_2, while the liquid, after this treatment, is found to contain ammonium chloride and a small quanity of a hydrochloride of primary amine. The proportion of isonitrile is evidently very small but the odor of these bodies is strong and characteristic, and their poisonous properties very marked. The low boiling points of the "heads" excludes all of these bodies

except methyl- and ethylisocyanide, which boil respectively at 59.6° and 78.1° C.

The application of this product (" heads ") is very limited. It has been used to dissolve caoutchouc, for which purpose, however, the naphthas of 120°-150° C. are preferred. In a note, M. Werner describes a fatal case of poisoning of a workman who inhaled the vapors of this same benzine, and experiments, made jointly with the author, upon animals, pointed to the isocyanides above mentioned as the cause of death. (*Bul. Soc. Ind. Mulhouse*, *Oct. 1884.*)   A. A. B.

Occurrence of Citric Acid in Seeds of Leguminous Plants. H. RITTHAUSEN.

The existence of citric acid, together with malic and oxalic acids, in the seed of the yellow Lupine (*Lup. luteus*) has already been shown. The author finds it also in the seed of *Vicia sativa* (vetch), *V. faba* (hog's bean), various varieties of peas, and in the white garden bean (*Phaseolus*). The powdered seeds are digested with water acidified with hydrochloric acid, the solution filtered, neutralized with an alkaline hydrate, and precipitated with lead acetate. This is suspended in water, treated with sulphuretted hydrogen, and the citric acid gotten in the usual way from the acid liquid. The white bean contains very little citric acid and peas contain less than the other legumes mentioned. (*Jour. f. prakt. Chem.*, 29, 357.)   F. P. V.

Melitose in Cotton-Seed. H. RITTHAUSEN.

The cotton-seed cake is treated with 80 per cent. alcohol (60–70° C.), the excess of alcohol distilled off, the residue freed from fat by means of ether, the remaining coloring matter precipitated with basic lead acetate and ammonia, and the excess of lead removed by sulphuretted hydrogen. Needle-like crystals of melitose are deposited on evaporating the solution, and these may be washed and recrystallized. The crystals, which form about three per cent. of the crude material, seem, on examination, to possess all of the properties of melitose. (*Jour. f. prakt. Chem.*, 29, 351.)

                                        F. P. V.

On Paranitrobenzoylacetic Acid. W. H. PERKIN, JR., and
GUSTAV BELLENOT.

It has recently been shown by Baeyer that phenylpropiolic acid
ether, when treated with H_2SO_4, takes up the elements of water
and is converted into benzoylacetic acid ether. The authors thought
it of interest to see whether, under the same conditions, paranitro-
phenylpropiolic acid ether, would be converted into paranitro-
benzoylacetic acid ether. This was found to be the case. After
some experimenting they obtained a compound which analysis
showed to be paranitrobenzoylacetic acid, formed according to the
reaction :

$$C_6H_4 \ (NO_2) - C{=}C{-}COOC_2H_5 \ + 2H_2O{=}C_6H_4 \ (NO_2) \ CO{-}$$
$$CH_2{-}COOH + C_2H_5OH.$$
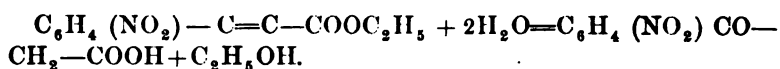
The ether was obtained from the above, by dissolving the free
acid in absolute alcohol, and saturating with HCl. The tempera-
ture during this treatment should not exceed 10^u C. (*Ber. d. chem.
Gesell*, **326**, *1884*.)   J. H. S., Jr.

On the Action of Aldehydes and Ammonia on Benzil.
    (Continued.)   F. R. JAPP and S. C. HOOKER.

The reaction between salicylaldehyde or furfuraldehyde and
benzil in presence of ammonia, differ from reactions of this class
previously studied by the authors. The two carbon atoms of the
dicarbonyl group instead of becoming doubly linked, separate in
such a way that the diketone is broken into halves, which become
two substituted acid radicals in the new compound. At the same
time the two aldehyde residues become linked by means of the
carbon atoms of the CHO groups. The salicylaldehyde com-
pound has been especially examined. When equal weights of
salicylaldehyde and benzil are dissolved with aid of heat and the
solution saturated with gaseous ammonia, a lemon-yellow, crystal-
line compound is separated, which has the composition $C_{28}H_{24}$
N_2O_4, and treatment of this with dilute HCl in sealed tubes at $210°$ C.
yields a new base, dihydroxystilbenediamine. The original com-
pound is dibenzoyldihydroxystilbenediamine, a substitution product
of this base, and was subsequently obtained by synthesis.
(*J. Ch. Soc.*, **265**, *672*.)   . . A. A. B.

On the Introduction of the Azo-Group, in the so-called Aromatic Para-compounds. P. GRIESS.

(*Ber. d. chem. Gesell*, 338, *1884.*)   J. H. S., Jr.

On the Existence of the Trimethylen Ring. W. H. PERKIN, JR.

(*Ber. d. chem. Gesell*, 323, *1884.*)   J. H. S., Jr.

On a new Synthesis of Anthrachinone. By W. PANATO-VITS.

Anthrachinone is obtained by the dry distillation of calcium phthalate.—(*Ber. d. chem. Gesell.*, 312, *1884.*)   J. H. S., jr.

ANALYTICAL CHEMISTRY.

On the Separation of I and Cl in the Dry Way. J. KRUTWIG.

On heating a dry mixture of KI and potassium bichromate (in excess), the I is completely expelled, and chromic oxide, potassium monochromate and bichromate remain behind, viz.:
$$6KI + 5K_2Cr_2O_7 = 6I + Cr_2O_3 + 8K_2CrO_4.$$
For the analysis, the KI is weighed out in a porcelain crucible. Six times as much $K_2Cr_2O_7$ is added, well mixed, with the KI, and the crucible again weighed. The crucible is then slightly heated until fumes of iodine cease to escape. This takes about 30 minutes. The crucible is weighed again, and the amount of iodine present calculated from the difference. The I may also be estimated from the amount of Cr_2O_3 formed, as follows : The melted mass is treated with water in a beaker, and heated for a short time on the water-bath. K_2CrO_4 and $K_2Cr_2O_7$ are quickly dissolved, and Cr_2O_3, which remains, is collected on a filter, washed and weighed. NaCl, on the contrary, is not attacked by $K_2Cr_2O_7$.

It is therefore possible to separate a mixture of KI and NaCl, by heating them in a porcelain crucible with $K_2Cr_2O_7$. The I is estimated as above, and Cl by acidifying the filtrate from the Cr_2O_3 with HNO_3, and precipitating with $AgNO_3$. (*Ber. d. chem. Gesell*, 341, *1884.*)   J. H. S., Jr.

Fractional Distillation in · a Current of Steam as a New Means of Investigating Naphtha. (*Preliminary notice.*) RASINSKI.

Steam is conducted from a boiler to the bottom of the distilling flask (not otherwise heated). The mixture of steam and hydrocarbon vapor is dephlegmated by cooling in tubes and by washing in Mendeljeff's dephlegmators (from one to three in number). These latter are not heated. The mixed vapors coming from the last dephlegmator are collected, after condensation, in quantities of 65–70 c. c., and for each such fraction the specific gravity and the ratio of water to oil (by volume or weight) determined. The numbers thus found serve as co-ordinates for the curves representing the results of each distillation. The fractioning depends upon the peculiarity of these hydro-carbons that, when thus distilled, the ratio between the quantity of oil and of water used in distilling varies with the specific gravity of the oil. Fractions with increasing specific gravities may thus be secured without risk of decomposition. (*Jour. f. prakt. Chem.*, **29**, *41*.)   F. P. V.

Determination of Morphine in Opium. V. PERGER.

On comparing the methods of E. Merk, Hager-Godeffroy, the *Pharmacopœa Austriaca*, ed. VI., and the one proposed by himself, the author finds most surprising differences in results obtained. The author's method is as follows : The opium is heated with barium hydrate and water, filtered, and washed with hot water. The filtrate, containing all morphine, is saturated with carbon dioxide and the whole rapidly evaporated to dryness on a water-bath. The dried mass is extracted with absolute alcohol and the alcoholic filtrate freed from alcohol by distillation. The residue is allowed to stand some time with ammonia water, brought upon a filter, washed with water containing ammonia, then with chloroform, then dried and weighed. This crude morphine may be purified by dissolving in acetic acid, adding a few drops of potassium ferrocyanide, filtering, neutralizing the filtrate with ammonia and allowing the morphine to crystallize out, collecting the crystals upon a filter, drying and weighing. (*Jour. f. prakt. Chem.*, **29**, *97*.)   F. P. V.

Abstract of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

January 6th, 1885.

310,164.—Furnace for the manufacture of iron direct from the ore.— C. Adams.

310,187.—Apparatus for refining sulphur.—F. Dickert.

310,192.—Fibrous pulp roofing pile.—J. F. Edson.

The fibrous pulp is pressed in moulds and dried, after which it is impregnated with a waterproof solution, and coated with a fireproof enamel.

310,205.—Fabric for covering heated surfaces.—H. W. Johns.

Consists of ropes or rolls of fibrous materials, woven with sheets of paper, sheathing, &c.

310,275.—Colored waterproof fabric.—T. Hawley.

310,302.—Process for the separation of metals.—B. Moebius.

This is a process for refining silver by electrolysis. The alloy as an anode is subjected to an electric current in a solution of nitrate of silver, nitrate of copper, and nitric acid.

310,334.—Asbestos paper.—S. Tingley.

A sheet of asbestos paper is covered on one or both sides with thin paper, coated with a salt, which will form a glaze when heated to high temperatures.

310,339.—Method of manufacturing hydraulic grape sugar.—L. Virneisel.

Consists in forming a magma of crystals of grape sugar hydrate from starch glucose, mixing the magma with a thin solution of grape sugar and draining.

310,376.—Apparatus for the manufacture of prussiate of potash.—E. R. Carhuff.

Not intelligible without illustration.

310,403.—Evaporating pan and furnace.—C. W. Frick.

Adapted for cooking two lots of juice at one time. Not intelligible without illustration.

310,404.—Fire extinguishing compound.—F. Frohlich.

Consists of an alkaline silicate, alum, common salt, and phosphate of ammonia.

310,410.—Incaustation preventive.—H. Gyrard.

Malt sprouts are distilled and the resulting liquor is added to the water in the boiler.

310,448.—Process of and apparatus for baryta or strontia treatment of saccharine liquors, and production and recovery of these reagents.—H. Leplay.

310,454.—Metallurgical furnace.—W. McKenna.

This furnace is adapted for burning gas.

310,461.—Non-conducting composition for refrigerators.—J. M. Ordway.

Consists of a non-conducting coating of granulated cork, bark, or pith, agglommerated with water glass, in combination with a lining of fossil meal or magnesia.

810,486.—Producing gelatinous and printing plates.—W. Woodbury.

Consists in producing a photographic design in gelatine plates, then drying and mounting them on solid backs, and coating the surface with tin foil. By subjecting this to pressure a metallic printing surface is obtained, which may be electroplated.

810,487.—Apparatus for the manufacture of gas.—A. L. Allen.

A current of steam or super-heated steam is passed continuously through a mass of highly heated carbon of gradually increasing temperature, and finally through one or more independent masses of incandescent carbon of equal temperature with the final temperature of the decomposing retort.

810,497.—Process of and apparatus for the fractional distillation of petroleum.—R. Dean.

Not intelligible without drawing.

810,500.—Process of constructing lead vessels.—H. Egells.

The body of the vessel is constructed of one of the harder alloys of lead—such as type metal—and lead is directly fused upon the surfaces to be exposed to corrosive action.

810,533.—Apparatus for the electrolytical separation and deposision of metals.—B. Moebius.

810,544.—Apparatus for manufacturing flexible roofing material.

January 13th, 1885. •

810,550.—Lime paint.—W. J. Adams and W. R. Polk.

A lime paint consisting of lime, salt, alum, syrup, and a gluey substance.

810,560.—Preparation of a fluid for making water repellent fabrics.—A. B. Conger.

Caoutchouc or other elastic gum is treated with gas of nitric or muriatic acid, and dissolved with paraffin or wax in naphtha or other mineral oil.

810,594.—Process of manufacturing asphaltic powder suitable for paving.—H. Kettmann.

Asphaltic concretes are made by mixing asphalum or bitumen, with pulverized material, while the latter are suspended in water.

810,604.—Manufacture of isatins and substituted isatins.—P. J. Meyer.

The isatins and substituted isatins are obtained from dihalogenized acetic acids, their salts, amides, ethers, and aldehydes or from amines, by directly fusing or boiling their solutions, and treating the product with a strong acid.

810,619.—Ore furnace.—E. F. Russell.

810,625.—Composition for granite or gravel roofing.—F. Vaughan.

A mixture of linseed oil, resin, pitch, beeswax, and carbolic acid.

810,744.—Gas retort.—A. C. Swain.

Not intelligible without drawing.

810,753.—Treatment of yucca or " sotal " fibre for the production of paper pulp or stock and obtaining by products therefrom.—G. B. Walker.

The fibre is steeped in acid sulphite liquors, then digested in borax liquor and sulphurous acid, and finally washed in a weak soda solution.

810,759.—Limekiln.—A. B. Weeks.

810,804.—Glass furnace.—J. V. Ebel.

January 20th, 1885.

810,887.—Fire-Extinguishing Compound. —J. M. Giblin.

A vessel of glass, or analogous frangible material, containing liquefied sulphurous oxide.

810,888.—Fire-Extinguisher.—J. M. Giblin.

810,889.—Fire-Extinguishing Compound.—J. M. Giblin.

Consists of a solution of sulphurous oxide, in an alkaline liquid.

810,899.—Plastic compound suitable for molding into various useful articles.—M. Mackay.

Consists of lac, gum sandarac, rosin, ivory, black, and asbestos.

810,901.—Process of making ferronickel and ferrocobalt.—H. Marbeau.

Mats or pigs of these metals are fused with potassium ferrocyanide or cyanide and one of the oxides of manganese, and at the moment of casting a small quantity of aluminium is added.

810,925.—Thermometer.—H. Weinhagen.

A dark, light-absorbing shield is placed behind the mercury column.

810,957.—Manufacture of compounds to be used for insulating.—A. Muirhead.

Consists of a mixture of purified paraffin wax or other hydrocarbons and gutta percha.

810,963.—Spirit Condenser.—F. Sonier.

Not intelligible without the drawings.

311,013.—Ice machine.—J. C. Kitton.

311,028.—Refrigerating machine.—A. Osenbrueck.

311,058.—Ore roasting furnace.—J. F. Carter.

311,062.—Refrigerating apparatus.—N. W. Condit, Jr., and T. Rose.

311,118.—Manufacture of amber varnish.—J. W. Goussen.

The amber is ignited upon a wire cloth, and allowed to drip through the cloth, after which it is boiled with the oil, and finished in the usual manner.

311,124.--Process and apparatus for making gas.—J. Hanlon.

312,125.—Process and apparatus for making gas.—J. Hanlon.

Illuminating gas is made by continuously heating the generating retorts by the combustion of gaseous products from a producer, and such products, after partial combustion, are used for alternately heating internally two fixing-chambers. Gas is generated continuously in the retorts, by passing superheated steam down through a body of charcoal, where it is decomposed, passing the resulting gas up through the vaporizing chamber, into which oil is admitted, and then passing the mixed gas and oil vapor through one of the heated fixing chambers, where they are converted into a fixed gas. One of the fixing chambers is being heated up while the other is used for fixing gas.

811,185.—Recovering rubber from rubber waste.—C. I. McDermott.

The fibre is removed from fibrous rubber waste or scrap, by treating with dilute acid, or acid containing materials for generating nascent chlorine.

811,156.—Manufacture of artificial stone compositions.—C. I. Walker.

Lime and silica are ground to powder and intimately mixed. The lime is then slaked and sand or gravel is added.

January 27th, 1885.

811,203.—Composition of matter for water proofing.—I. V. Reagles.

The composition consists of wood alcohol, castor oil, gum camphor, pyroxiline, and gum shellac.

811,223.—Filtering paper.—G. H. Billings, E. W. Carter, and D. R. Smith.

The sheets of filtering paper have a fibrous material embedded in the center.

811,257.—Filtering apparatus.—C. W. E. Piefke.

811,258.—Amalgamator.—D. S. Randolph.

811,271.—Disinfecting apparatus.—R. Thayer.

811,287.—Plastic cement mixture for non-conducting coverings for boilers, &c.—D. A. Brown.

The covering consists of infusorial earthy lime and asbestos.

811,294.—Process of surface coating iron.—P. H. Conradson.

The iron is exposed to sulphur vapor in a muffle in an atmosphere of carbon dioxide, at a temperature of 500°–600° C. Sulphuretted hydrogen may be substituted for the sulphur vapor.

811,360.—Process of disinfecting baled rags.—S. W. Parker and H. Blackman.

A perforated nozzle is inserted into the bale, and the disinfectant is cause to pass through the nozzle and out through the perforations thereof.

811,401.—Paint.—W. H. Wilber.

A priming paint composed of liquid asphaltum, rosin, linseed oil, turpentine or naphtha and white lead.

811,403.—Furnace for generating illuminating gas.—S. J. Anthony.

Steam is superheated and decomposed in the lower part of the generator, and the resulting gas is carburetted and fixed in the upper part thereof. Perforated tile or fire brick strainers in the upper part of the furnace serve to heat the gas and to remove from it the lamp black and tarry matter.

811,417.—Method of manufacturing maltose.—L. Cuisinier.

The amylaceous material is reduced to a pulp, and then water containing an infusion of malt is added. The mass is gradually heated to about 80° C. for about 1 hour, and then digested under a pressure of 1–2 atmospheres for about half an hour.

811,441.—Gas generator.—L. Mond.

W R.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING, held February 6th, 1885.

Dr. J. C. Booth in the chair.

Minutes of the meeting of January 2d were read and approved.

A synopsis of the proceedings of the Board of Directors, held January 6th, was given by the Secretary.

The following new members were elected:

Dr. A. Miller Jacobs, 92 New Church street, New York City.

Joseph Little, Passaic, New Jersey.

Edward K. Dunham, Ph. B., 93 Boylston street, Boston, Mass.

S. W. Williams, 72 William street, New York City, was proposed as a member.

The resignation of E. W. Leggett, of Elizabethport, New Jersey, was read and accepted.

The following papers were read:

Methods of Opium Analysis, by J. H. Wainwright.

A singular method of Sugar Analysis, by P. Casamajor. Read by Prof. Breneman in the absence of the author.

A New Green Coloring Matter, by J. H. Stebbins, Jr.

Benzylmethylaniline, by J. H. Stebbins, Jr.

Papers for the next meeeting, March 6th, were announced, as follows:

Methods of Opium Analysis (2d paper), by J. H. Wainwright.

The Chairman referred to the recent death of Prof. Benjamin Silliman. On motion of Mr. Stebbins the chair appointed a committee, consisting of Profs. S. W. Johnson and A. R. Leeds, to take appropriate action.

Dr. Leeds, Vice-President, announced that the committee on Nomenclature would consist of the following members: Messrs. Breneman, Stebbins, Moore, Rupp and Leeds.

The chairman read a letter from Mr. C. B. Norton, Secretary of the American Exhibition (London, 1886), inviting the co-operation of the Society. Consideration of the subject was deferred until next meeting.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

ON A NEW GREEN COLORING MATTER FROM
BENZYLMETHYLANILINE.

(Preliminary Notice.)

By James H. Stebbins, Jr.

E. &. O. Fisher have shown that benzaldehyde in the presence of a dehydrating medium (such as zinc chloride), can be made to unite with tertiary amines (as dimethylaniline), to form the leuco-bases of new and interesting dyestuffs. They obtained thus from benzaldehyde and dimethylaniline, the leuco- base of bitter almond oil green, or tetramethyldiamidotriphenylcarbinole, which was found to be identical with Doebner's malachite green, obtained by the action of benzotrichloride upon dimethylaniline.

Using this reaction, it seemed of interest to extend the investigation somewhat further, and try the action of benzaldehyde upon other tertiary aromatic amines. For this purpose I selected a new compound (to be described in a subsequent paper), obtained by the action of benzylchloride upon methylaniline, and which may be called benzylmethylaniline. This new tertiary base was then treated according to the directions of E. & O. Fisher.

Two pts. benzylmethylaniline were mixed with 1 pt. of benzaldehyde and 1 pt. of fused zinc chloride, and heated on the water bath until the smell of benzaldehyde had nearly disappeared.

The melt was now poured into a flask and an excess of caustic soda solution added. Steam was then passed through the mixture to drive off any unaltered benzaldehyde or benzylmethylaniline which might be present. The remaining mass was then shaken up with ether, and filtered from the zinc precipitate.

On evaporating the ether, a thick yellowish colored oil was left behind, which showed no tendency to crystallize, even upon long standing.

This oil is the leuco- base of a green coloring· matter, and may be called dimethyldiparaamidoditolylphenylmethane. It is formed according to the following equations.

(1.)

$$C_6H_4\ NH.CH_3 + C_6H_4\ CH_2Cl \rightarrow C_6H_4N \diagup{CH_3} \diagdown{C_6H_4CH_2} + HCl$$

(2)

$$C_6H_5CH \diagup O + \begin{array}{c} H|C_6H_4N \diagup{CH_3} \diagdown{CH_2-C_6H_4} \\ CH_2-C_6H_5 \\ H|C_6H_4N \diagup \diagdown CH_3 \end{array} \cdot C_6H_5CH \diagup{C_6H_4N \diagup{CH_3} \diagdown{CH_2-C_6H_4}} \diagdown{C_6H_4N \diagup{CH_2-C_6H_4} \diagdown CH_3} + H_2O$$
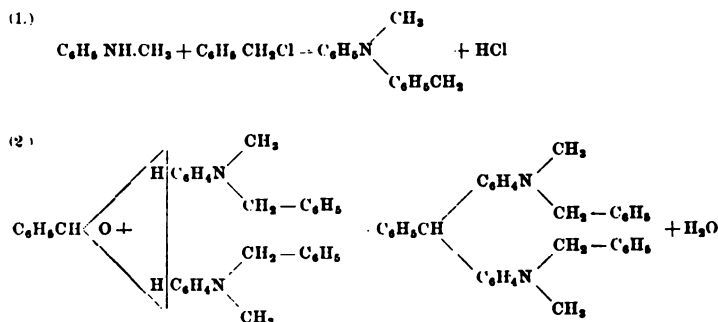
This leuco- base on being treated with oxidizing agents, is converted into a fine green coloring matter. The oxidation may most conveniently be performed in the following manner :

One pt. of the leuco- base was heated with ½ its weight of chloranil on the water bath until the melt had become hard and assumed a fine, coppery luster.

It was then allowed to cool, broken up, boiled with KOII and AgNO₃ in order to remove the hydrochloranil, which goes into solution. On cooling, the mass becomes brittle, and may be removed from the alkaline solution and washed.

In this state the coloring matter appears of a dark green color. It is soluble in alcohol with the same shade, but is insoluble in water. It is also sparingly soluble in HCl.

Whether this compound is really constituted as above set forth, I am unable at present to decide, as the investigations relating to it are still incomplete.

The subject will be continued at some future time.

BENZYLMETHYLANILINE.

(*Preliminary Notice.*)

By James H. Stebbins, Jr.

This compound was prepared as follows:

One part of methylaniline and 2 parts of benzylchloride were heated, with return cooler, to boiling, for four hours. The unaltered benzylchloride was then distilled off, and the resulting mixture fractioned. From 192–210°C. some unaltered methylaniline passed over. The temperature then rose to 317°, and from there shot up to 360° C., so that the thermometer had to be removed. The fraction passing over between 317.5 and 360° has a pale yellow color, and a pleasant, aromatic smell. It is sparingly soluble in aqueous HCl. It forms a nitroso- compound when treated with Na NO_2. This nitrous body is reduced by zinc dust to a colorless solution, most probably owing to the formation of a paraamido- compound. The NO group must, therefore, be in the benzol nucleus, making the substance, therefore, a tertiary amine. If treated with chloranil in the cold, a deep blue coloring matter is formed, which, upon heating, turns green.

· This compound is, therefore, probably benzylmethylaniline, mixed with other substances, the exact nature of which has not yet been determined.

ON A SINGULAR PROCESS OF SUGAR ANALYSIS.

By P. Casamajor.

Some dozen years ago there appeared, in the *Journal des Fabricants de Sucre* a letter signed *Un Abonné*, calling attention to an empirical process of sugar analysis, used by Parisian sugar testers. This communication was the occasion of denials of its truthfulness by several sugar testers, and also of counter-statements by chemists who confirmed the accuracy of the statements of *Un Abonné*.

I have reason to believe that such a process was used pretty generally at that time, because, having occasion, shortly after the appearance of the letter of *Un Abonné* above mentioned, to test several marks of a cargo of raw beet sugar from France, I found

that the tests by the empirical process there given agreed more closely with the tests made in Europe than those obtained by the optical saccharimeter.

This empirical process is called " Process of the $\frac{4}{5}$." To test a sugar by it, the water is determined by evaporation, and the ashes by incineration, after addition of sulphuric acid. These are the only tests actually made. They require a very small outlay for apparatus. The return of the analysis of a sugar is made on a blank of this form :

Sugar____ _____

Glucose _____

Ashes_____

Water _____

Organic matters, not saccharine, and loss_____

Total _____ 100

To fill up this blank, the water and the ashes are first put down as found by actual tests. The other constituents are obtained by what may be called *guessing*, within prescribed rules. To get at " organic matters, not saccharine, and loss," the sugar tester takes $\frac{1}{5}$ of the quantity of ashes as determined by actual test, and hence the name of " $\frac{4}{5}$ process." After which there only remain " Sugar " and " Glucose " to fill up, and these are easily got. Beet sugars contain very little glucose (invert sugar), so no serious mistake can occur in guessing at this. The sugar tester, however, is guided by the color of the sugar. If this is dark, compared to most beet sugars, the glucose is estimated at about $\frac{3}{4}$ of 1 per cent. If the sugar is light glucose is put down at about $\frac{1}{10}$ of 1 per cent. Intermediate colors give intermediate percentages of glucose. As the quantity is never very great no important mistake can be made in the item of glucose.

As to the item which figures as " sugar " it is very easily obtained by adding up all the others and subtracting the sum from 100.

Take, as a numerical example, a beet sugar, having 3 per cent. of water and $2\frac{1}{2}$ per cent. of ashes. According to what has been said, the analysis would be given as follows, supposing that the

color of the sample justified guessing that glucose was equal to 0.3 per cent.

Sugar	92.20
Glucose	0.30
Ashes	2.50
Organic matter, not saccharine and loss	2.00
Water	3.00
Total	100.00

To understand how such a process could ever have come into use, we must remember that most raw beet sugars are of very high grade compared to the generality of raw cane sugars. After deducting water and real sugar, as ascertained by actual analysis, the remainder is comparatively a small percentage. If now the ashes are found generally to be about $\frac{2}{5}$ of the total remainder, it is conceivable that a process like this may give in most cases results which are satisfactory to the buyer and to the seller.

But there remains something else to be considered in relation to this process : It is that beet sugars are sold on the basis of *rendement*, formed on the assumption that 1 per cent. of ashes prevent the crystallization of 5 per cent. of sugar. Now, in the numerical example given, the sugar being stated at 92.20, we would have to deduct $2\frac{1}{2} \times 5 = 12.50$ from 92.20, to obtain, as *rendement*, 79.70 per cent. In doing this we have actually done the same thing as taking the water (equal to 3 p. c.) and glucose (0.30) from 100, which leaves 96.7. Now we take the ashes ($= 2\frac{1}{2}$), add $\frac{4}{5}$ as much and get $2.50 + 2. = 4.50$. We now multiply the ashes by 5 (2.50×5) and get 12.50, which added to 12.50 makes a sum equal to 17. This, deducted from 96.70, leaves as *rendement* 79.70, the number already given. To obtain it we have deducted from 100, the following quantities :

Percentage of water, as determined	3.
" " glucose, guessed at	.30
" " ashes multiplied by	6$\frac{4}{5}$.
$= 2.50 \times 6.8$	17
	20.30

The percentage of ashes is incomparably the most important element in a sugar analysis by this process.

In the way that a chemist is expected to make a sugar analysis, he is to determine the sugar by the optical saccharimeter, the water by evaporation and the ashes by incineration.

Indeed the water is of no importance and may be left out of the ordinary commercial analysis. From the sugar as given by the saccharimeter, the sugar tester deducts 5 times the weight of the ashes. The result is the *rendement*. If the sugar should be found to be 92 p. c. and the ashes 2.50, the *rendement* would be 92—(2.5 × 5) = 79 p. c. It is on this number, 79, that the sale of beet sugar is based in all European markets, which is a fact of itself more extraordinary to me than the $\frac{1}{4}$ process. The "coefficient 5," which is generally accepted, is based on nothing but assumptions which have no foundations. Those who are willing to buy and sell by the " coefficient 5 " need find no fault with the $\frac{1}{4}$ process.

My attention has been called to a description of the $\frac{1}{4}$ process in Wurtz, *Dictionnaire de Chimie*, III., p. 67. After describing Clerget's process, the author of the article says : "Depuis un certain " temps, pour éviter un dosage aussi long, on employe, dans les " laboratoires, un procédé beaucoup plus simple et qui donne des " résultats à peu près exacts." * * * Then follows a brief description of the $\frac{1}{4}$ process.

THE ESTIMATION OF MORPHINE IN OPIUM.
By J. HOWARD WAINWRIGHT, PH. B.

As one of the chemists connected with the United States Laboratory at the port of New York, my attention has been in a large measure directed to the assaying of opium, samples of which, from every case entered here, are sent to this laboratory for the estimation of morphine.

The literature upon this subject is very voluminous, probably more so than that relating to the assay of any other drug, and comprises the descriptions of many methods.

The requirements of a method adapted to the work of this Laboratory are, rapidity of manipulation, simplicity of the apparatus and, most important of all, accuracy of results. I have, therefore, undertaken an investigation of this very interesting subject, the purpose of which has been, not to test all of the methods published, but simply to try some of the most general and to compare them in order to find one, or the essential features of one, which best meets the above demands.

There are not many different varieties of opium imported at this port, by far the largest amount being Smyrna or Turkish, occasion-

ally some Persian, and very rarely small amounts of Egyptian and Indian—these latter usually in sample lots.   The total number of samples assayed during the year ending December 30th, 1884, was 401, the percentage of morphine being generally between 9 and 15, some few samples of Persian opium yielding as high as 18 per cent, and two or three samples of Symrna yielding less than 9 per cent. As the law prohibits the importation of the drug showing less than this proportion of morphine, such cases as the latter are rare. Assays are made upon samples as they are received from the official drug examiner. When the percentage is over 15 per cent. or under 9, duplicate determinations are invariably made.

The sampling of opium for the morphiometric assay is a matter of great importance, especially when the drug is in the moist commercial condition.

The best method, and the one usually employed for sampling a case, is described by Dr. Squibb in his " Ephemeris," Vol. I., No. 1, as follows :—" About every tenth lump of a case should be sampled by cutting out a cone-shaped piece from the middle of the lump with an ordinary pocket knife.   Then, from the side of each cone, a small strip is taken from point to base, not exceeding half a gramme from cones which would average 10 to 15 grammes, and the cone is then returned to its place in the lump.   The little strips are then worked into a homogeneous mass by the fingers, and the mass is wrapped in tin foil, moist cloth or paper to prevent drying, until it can be weighed off for assay."   This sample obtained from the case should not be less than 100 grammes, and should be sampled down to the convenient weight to be taken for assay.   This is quite important, as I have found that the morphine contained in pieces taken from different parts of the same sample lump frequently varies as much as one or more per cent.   Also, whilst some opiums may be " worked into a homogeneous mass by the the fingers," as above, in others this will be found very difficult if not impossible, as they may be either too moist and sticky or too hard and dry.   I am, therefore, in the habit of sampling the large sample lumps in one of three ways, according to the condition of the drug.   If quite moist the ball is flattened out and small portions are taken from every part on the end of a pen knife until the required weight is obtained ;   or, whenever possible, a thin section is cut through the middle of the ball, and

from this the sample is taken from around the edges and from
the centre, and when the opium is hard and dry, or where great
accuracy is required, the ball is broken up in a mortar as finely
as possible, weighed and dried, the moisture being determined
from the loss in weight.   It is then powdered and thoroughly
mixed, and the proper quantity weighed off.

The method of assay formerly in use here is, perhaps, the most
simple, being little more than a rough estimation of morphine
yielding results which are at best only approximate, and not in
any way to be relied upon where great accuracy is required.
However, as it is extremely simple, and with a little practice, easy
of manipulation, it may be worthy of a brief description. Ten
grammes of the sample are weighed off into a porcelain mortar and
allowed to macerate about twelve hours or over night with 50 c. c.
of hot water. It is then thoroughly mixed with the pestle and the
mass transferred to a linen or flannel filter of convenient size with
as little hot water as possible. The filtrate is allowed to run into
a flask, accurately marked at 100 c. c., and when all that will has
run through the filter and contents are squeezed between the fin-
gers until most of the extract is expressed, it is then moistened with
a little hot water and again expressed as above. This moistening
and expressing is repeated until exactly 100 c. c. of extract and
washings are obtained. If the extract comes through cloudy,
which is sometimes the case, it will have to be refiltered through
paper. The paper is then washed, and the extract, then more
than 100 c. c. must be concentrated to that volume, or exactly
one-half taken. If the extract in the flask is exactly 100 c. c.,
as it should be, it is well shaken to insure thorough mixture and
allowed to stand and settle for about one hour; 50 c. c., representing
five grammes, are drawn off with a pipette and transferred to a
small beaker, a very slight excess of a solution of equal parts of
ammonia and alcohol is added, and the liquid well stirred and al-
lowed to stand over night, when the impure morphine will crystal-
lize out. These crystals (which it will often be found necessary to
detach from the sides of the beaker with a small steel spatula) are
collected upon a tared filter and washed with a little cold water,
applied drop by drop around the edges of the filter, until it runs
through almost colorless. The filter and contents are now dried at
a temperature not exceeding 100° C, and washed with about 25 c. c.

of ether to remove the narcotine, again dried and then weighed. From repeated experiments 85 per cent. of this weight was found to represent approximately the weight of the morphine.

The only advantage of this method is its extreme simplicity and economy of time. It was originally adopted because of the very great number of samples which then required daily examination. In ordinary cases its disadvantages however were found to be many. It is only applicable to a moist opium, as this is the only one which will yield an extract running clear through the linen or flannel filter. It is also difficult to extract the opium completely in this manner with 100 c. c. of water; at least double that amount is required. This increased volume, however, would involve the necessity of concentrating the liquid, which otherwise would be too dilute, and thus time would be lost. The precipitated morphine (it can hardly be called crystallized) is always very impure and dark colored and requires a great deal too much water to wash it, and always carries with it a large proportion of narcotine which the ether will not remove unless a large quantity is used, and then only imperfectly ; the precipitate usually forming large, hard lumps. It is also difficult to remove all the precipitate from the sides of the beaker, which, however, would make no difference if the beaker were tared. The time occupied by this method is ordinarily about 48 hours, and not more than five, or at most eight samples can be conveniently run at the same time. Having used this method for upwards of six months and finding it not at all satisfactory, as something more than a rough assay was desired, I concluded to try some of the various methods published and compare the results obtained.

The method which I have been using for some time past and which leaves little to be desired, is essentially that published in the " *Ephemeris*," by Dr. Squibbs, whose kind permission I have to describe it briefly, with a few comments which may not be amiss.

I have compared this method with the official one of the Pharmacopœia and also with others, upon a specially prepared sample of opium made up from selected specimens which were dried, powdered and thoroughly mixed. In four different parts of this sample the morphine was determined by Dr. Squibbs' method, and the

average of the results obtained was taken as the percentage of
morphine.

The following is a brief description of this method of assay, as
used in my own practice. It consists of three distinct operations,
viz.: 1st. The preparation of the extract. 2d. Separating the mor-
phine therefrom, and 3d. The treatment of the seperated alkaloid.

1st. A convenient weight of the sample (preferably about 10
grammes) is introduced into an ordinary salt mouth vial of about
4 to 6 ounces capacity, fitted with a good cork. About 100 c. c.
of *boiling* water is added and the bottle is tightly corked and
allowed to stand, after frequent hard shaking, for from 12 to 24
hours. The magma is allowed to settle and the dark extract is de-
canted upon a filter of convenient size. When most of this extract
has run through into a medium sized beaker, from 30 to 50 c. c. of
boiling water is added, the bottle is well agitated, and the contents
are then transferred to the filter with as little hot water as possi-
ble. When all the liquid has drained through the filter it is care-
fully washed down with a very little hot water, applied drop by
drop around the edges, and allowed to drain as much as it will.
As soon as the liquid ceases to drop the beaker is replaced by an
evaporating dish of about 100 to 150 c. c. capacity, and the con-
tents of the filter are brought back into the bottle by means of a
small spatula, and again shaken up with about 50 c. c. of hot
water. They are then thrown upon the same filter and are washed
completely upon the filter from the bottle, this washing being con-
tinued until about 100 c. c. have run through into the dish, or until
the washings come through colorless. The dish is now placed upon
a water bath and the weak extract evaporated, adding to it from
time to time the stronger portion from the beaker, until the whole
is concentrated to a volume of about 20 to 25 c. c. The concen-
trated extract is transferred with as little water as possible, to a 2
ounce Erlenmyer flask, accurately tared and provided with a tight
fitting cork, and allowed to cool. It is now ready to be submitted
to the second part of the process, viz., the separation of the
morphine.

2d. After adding 10 c. c. of 95 per cent. alcohol, the flask is agi-
tated and a volume of ether equal to that of the contents is added,
the cork is tightly fitted and the flask well shaken. The cork is
now removed, and, before the ether has had time to separate, a

slight excess (about 4 c. c.) of a 10 per cent. solution of ammonia is added. The cork is again replaced and the flask well shaken until crystals of morphine begin to separate. The flask is now set aside in a cool place and the separation of the alkaloid allowed to continue for about 12 hours, when it will be complete. This complete separation may also be accomplished in from half an hour to two or three hours by continuous or frequent agitation.

The alcohol is added in order to permit of the ether mixing readily with the aqueous extract and thereby prevent the separation of narcotine which is readily soluble in this menstruum.

3d. When the separation of morphine is complete the cork is removed from the flask and the upper stratum of ethereal fluid carrying most of the narcotine, etc., is carefully decanted through a tared filter of 9 cm. diameter, without disturbing the dark, watery liquid in the bottom of the flask. Upon this dark liquid is now poured about 20 c. c. more ether which is rinsed around the sides of the flask and the surface of the liquid and is decanted carefully through the filter as before, that remaining being absorbed by means of a strip of blotting paper. The filter is washed down with a little more ether, applied drop by drop around the edges and allowed to dry so that the heavy liquid which is now thrown upon it, together with the morphine, will pass through readily. The crystals remaining in the flask are then washed upon the filter with cold water and the washing continued until the water comes through colorless.

The filter and contents are removed from the funnel, and the edges, having been carefully folded together, are pressed between folds of blotting paper until most of the moisture is absorbed. It is then dried in an air bath (together with the tared flask, if any of the crystals remain adhering to its sides) at a temperature of 100° C., and weighed, the result obtained, after subtracting the tare of the filter (and flask, if it has been found necessary to dry and weigh it), will be the weight of morphine in the sample taken.

Dr. Squibb directs that 1 gramme of these crystals, finely powdered, should be weighed off and treated in a large test tube fitted with a cork, with 10 c. c. of officinal lime water; upon occasional shaking the whole should dissolve, thereby showing the absence of narcotine.

He also says that the filter should be tared both before and after weighing the crystals.   This, I think, hardly necessary, as the coloring matter and gumming substances can be washed quite free from the paper and crystals without danger of loss of morphine if the water used is quite cold.   I have tried this repeatedly and find that 50 c. c. of water used in washing will not make any great difference in the weight of the morphine.

It is also my experience that the use of *hot* water in making the extract seems to work much better than cold ; the final results of the assay, if carefully conducted, being about the same in either case, but the opium can be completely extracted with much less water in the former case, the resulting liquid filters much more readily, and the magma is much easier to wash.

I hope to continue this subject in a future paper describing some results with other methods upon the sample already referred to.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Note on the Heats of Dissolution of the Sulphates of Potassium and Lithium. (S. U. Pickering.)

Calorimetric Determinations of Magnesium Sulphate. S. U. PICKERING.

Neither potassium nor lithium sulphate indicate, by their respected heats of solution, that they can exist in different modifications such as the author has shown belong to sodium sulphate.

As to magnesium sulphate, great difficulty was found in preparing a pure sample of the monohydrated salt. Determination of sulphur trioxide in a given sample is not sufficient to establish its identity, since the errors incident to the determination represent too large a quantity of water. For the same reason a determination of magnesium leads to no conclusion that can be depended upon. Determination of the water itself is the only available method. The heptahydrated salt is permanent in the air, however, and yields $6H_2O$ at temperatures between 150° and 160°. The salt obtained by loss of a quantity of water corresponding closely with the value for $6H_2O$ may be assumed to be the monohydrated salt, and correction can be made for difference in water, provided the heats of solution of the anhydrous and heptahydrated salts are known. The value of such corrections depend also upon the truth of the assumption that the six molecules of water in the heptahydrated salt are combined with the same energy. The monohydrated salt obtained by heating within the prescribed limits, showed no variation in heat of solution for different temperatures in preparation, and no modification therefore exists. The difference between the results of Favre and Thomsen and the author, depend probably upon imperfect dehydration. Anhydrous magnesium sulphate is readily obtained, and yields no modifications. The heat of solution obtained agrees with that obtained by Favre. The phenomena of rehydration of the anhydrous and monohydrated salt respectively, indicate that the latter cannot be formed as the first product of the action of water on the anhydrous salt. (*Jour. Chem. Soc.*, **266**, 98–100.)   A. A. B.

On a New Method of Determining Vapor Pressures, etc. W. RAMSAY and S. YOUNG.

Using a new and simple apparatus of their own design (not intelligible without the cut) the authors have investigated the vapor pressure of acetic acid (liquid and solid).

The V. P. of the liquid, according to a table constructed by graphic interpolation from the numbers obtained in a series of observations, is 3.50 at 0° C., 56.2 at 50°, 202 at 80°, 416.5 at 100°, and 582.6 at 110° ; V. P. of solid, 2.02 at 0°, 5.19 at 10°. These results differ widely from those of Landolt and Müller, but approach more closely to those of Regnault. Regnault attributed these discrepancies to presence of acetone, but the authors regard them as depending upon the presence of air and moisture and to the forms of apparatus previously used. These difficulties are avoided in the present apparatus. (*Jour. Chem. Soc.*, **266**, 42.)

A. A. B.

Note on Solubility of Certain Salts in Fused Sodium Nitrate. F. B. GUTHRIE.

A study of what is called *anhydrous solubility*, i. e., solution of a given substance by another in a state of fusion. When one salt is dissolved in this way by another, the quantity dissolved increases with temperature, but on cooling of the mass the excess separate unaltered while a part remains dissolved. The " eutectic alloys " (permanently associated salts) obtained by this process, using sodium nitrate as the solvent for the sulphates, carbonates and chromates of Pb, Ba, Sr and Ca, contained the following percentages of the salts named :

	SULPHATE.	CHROMATE.	CARBONATE.
Ba	2.61	.205	.916
Sr	1.84	2.133	.69
Ca	1.477	.547	.294
Pb	6.81	.245	....

Results with potassium nitrate are also given. (*Jour. Chem. Soc.*, **266**, 94.)

A. A. B.

On the Application of Iron Sulphate in Agriculture and its Value as Plant Food. A. B. GRIFFITHS.

The general conclusions of the author from the experiments described in this and preceding papers, is that ferrous sulphate is a good plant food when sparingly applied. A solution containing as much as ⅓ per cent. of Fe SO_4, however, is fatal to most plants. A fairly large proportion of soluble iron in the soil is favorable to the growth of plants developing a large amount of chlorophyll, especially in the leaf of the plant. Iron is regarded by the author as closely related to the production of chlorophyll and the increased production of soluble carbohydrates, woody fibre and fat in certain cases is a direct consequence of the increase in chlorophyll. Phosphoric acid in certain cases increased as ferric oxide in the ash of the plant increases. Nitrogen is perceptibly increased by the use of ferrous sulphate, and the salt acts also as an antiseptic agent in the soil to prevent parasitic diseases of the plant. (*Jour. Chem. Soc.*, 266, 46.)   A. A. B.

ORGANIC CHEMISTRY.

On Azo- and Disazo- Compounds of the Kresoles. E. NÖLTING and O. KOHN.

Very little is known about the azo- compounds of the kresoles. The only reference on the subject being by Mazzara, (*Gazzetta Chimica Italiana*, 9, *428*) who produced phenylazoparakresole, obtained by treating a dilute solution of parakresole with diazobenzole nitrate, and by Stebbins, (*Ber. d. chem. Gesell*, 12, *718*) who produced phenylazokresolesulpho- acid (from coal-tar kresole). The author, therefore, thought this subject worthy of investigation.

Parakresole unites with diazo- compounds with the same ease as the phenoles not substituted in the para- position.

The diazo- residue $(C_6H_5-N=N;-C_6H_4{<}^{HSO_3}_{N=N-}$

etc., standing in relation to the hydroxyl, in the ortho- position.

Disazo- compounds could not be obtained.

Ortho- and metakresole form with diazo- compounds oxyazobodies, in which the azo- group takes the para- position, in relation

to the hydroxyl group. Both these easily form disazo- compounds. The following compounds are described :

Phenylazo-p-kresole, C_6H_5—N=N—C_6H_3 $\diagup$ OH (1) $\diagdown$ CH_3 (4)

Phenylazo-p-acetylkresole, C_6H_5—N=N—C_6H_3 $\diagup$ OC_2H_5O (1) $\diagdown$ CH_3 (4)

Phenylazo-p-benzolekresole, C_6H_5—N=N—C_6H_3 $\diagup$ $OCOC_6H_5$ (1) $\diagdown$ CH_3 (4)

Azobenzoleazokresole, C_6H_5—N=N—C_6H_4—N=N—C_6H_3 $\diagup$ CH_3 $\diagdown$ OH
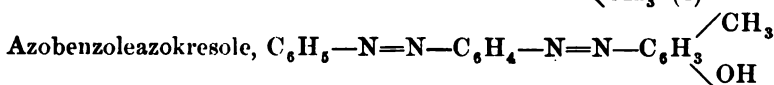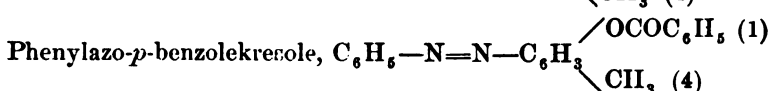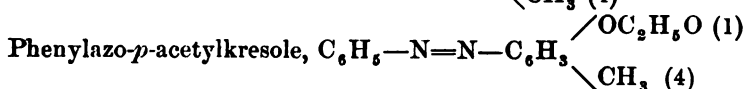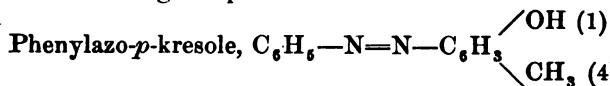
Paratolylazokresole.
Parasulphophenylazoparakresole.
Phenylazoorthokresole.
Phenyldisazoorthokresole.
Phenylazoorthoacetylkresole, etc.   (*Ber. d. chem. Gesell, 1885,* 351.)   J. H. S., Jr.

On Nitrosoorthokresole. E. Nölting and O. Kohn.

Orthokresole is dissolved in 30-40 pts. of water and treated with the theoretical amount of a standard solution of nitrosyl sulphate in the cold. After a short time a grayish precipitate settles to the bottom of the beaker, and constitutes the raw nitrosokresole. This is collected on a filter and dissolved in ammonia; the impurities are precipitated with CO_2, the ammoniacal solution is poured into cold dilute H_2SO_4, and the substance finally crystallized from water or benzole. Long white needles, soluble with difficulty in cold water, easily soluble in boiling water, alcohol, ether, or chloroform. Soluble in dilute caustic alkalies with a red brown color. Acids reprecipitate it as a white, flocculent body. Melting point, 134-135.° (*Ber. d. chem. Gesell, 1885,* 370.)   J. H. S., Jr.

On Paraamidoacetanalide, and a few new Azo- Compounds. R. Nietzki.

Up to the present time it seems to have been impossible to convert the nitro- compounds of acetylated aromatic amines into the corresponding amido- compounds.

Hobrecker (*Ber. d. chem. Gesell*, 5, *p. 920*) obtained from para-nitracetanilide, on reduction, paraphenylendiamine and acetic acid. The author found, however, that by treating the paranitracetanilide with the proper reducing agent, that he could obtain menacetyl-paraphenylendiamine. The reducing agents used in this case were iron filings and acetic acid. The acetyl group may be easily removed by boiling with dilute sulphuric acid.

On diazotizing this compound and combining it with β naph-tholdisulpho- acid, a scarlet dyestuff crystallizing in golden leaflets, is obtained. It has the following composition :

$$C_2H_3O—HN—C_6H_4—N_2—C_{10}H_4HO \, (HSO_3)_2$$
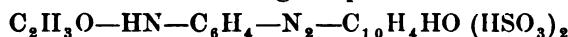
From this the acetyl group may be removed, in the shape of acetic acid, by boiling the substance with dilute H_2SO_4. The removal of the acetyl group converts the substance into a Bordeaux red dyestuff. This latter may now be diazotized and combined again with betanaphtholedisulpho- acid. This produces a new body, crystallizing in needles with beetle-green lustre. This compound dyes wool of a deep indigo-blue color. Commercially, however, it is of little value on account of its instability.

Diazoacetanilide and aniline yield a highly yellow colored diazo-amido- compound, which, on being heated with aniline and aniline chloride, may be easily converted into the corresponding amidoazo-compound. The acetyldiamidoazo- compound so obtained, crystal-lizes in light yellow leaflets with golden lustre. Melting point, 212° C.

It may be represented by the following formula :

$$H—N—C_6H_4—N=N—C_6H_4NH_2$$
$$|$$
$$C_2H_3O$$
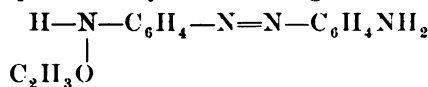
This compound, on being boiled with dilute H_2SO_4, is converted into symmetrical paradiamidoazobenzole, which melts at 255° C. (*Ber. d. chem. Gesell, 1885*, 343.)   J. H. S., Jr.

Notes. E. NÖLTING.

1. Orthonitrobenzyl chloride.

Beilstein and Geitner observed that when benzylchloride was nitrized, a certain oil was formed, together with the ordinary crystallized paranitrobenzylchloride. This they supposed to be an isomer of the nitro- compound, but gave it no further investiga-

tion. This matter was taken up again by the author, who had some of the oil at his disposal. A sample of the oil was oxidized with $KMnO_4$ (5 grms. per lit.) and yielded besides a little benzoic acid, and paranitrobenzoic acid, a large amount of orthonitrobenzoic acid. Metanitrobenzoic acid could not be found. Benzyl chloride on being nitrized at 15°C., forms principally paranitrobenzylchloride, whereas, when nitrized at the ordinary temperature, a large amount of the ortho- compound is formed. This would there fore be an easy method of preparing the nitrobenzoic acids.

2. On the High Boiling Phenols Contained in Coal Tar.

It is well known to chemists that anthracene oil contains besides anthracene, compounds possessed of a phenol character. The isolation of these compounds has, however, never been performed. The author found that the raw phenols obtained by shaking up the crude tar oils with NaOH + Ag, and afterwards precipitating them with an acid, begin to boil at 240–250° C., and distil under partial decomposition to 360° and over. In vacuo the distillation runs much better. The fraction boiling from 300 and over was examined. It contained still some hydrocarbons, which were removed by dissolving the mixture in NaOH + Ag, diluting with water, and shaking the mixture repeatedly with toluol. The phenoles remaining in solution were precipitated with an acid, extracted with ether, and then distilled over zinc dust. A mixture of semi-fluid hydrocarbons was obtained, which were then oxidized with chromic acid. The oxidation product contained small amounts of phenanthrenchinone, and anthrachinone. It is therefore probable that the tar oil contained the phenols of anthracene and phenanthrene. Besides these, however, it contains a number of other phenolic bodies.

3. On the Constitution of Phthalyl chloride.

(Ber. d. chem. Gesell, 1885, 385.)   J. H. S., JR.

On Isatin. H. KOLBE.

Chromic acid oxidizes isatin (dissolved in glacial acetic acid) to a product $C_8H_5NO_3 = C_6 \left\{ \begin{array}{c} H_4 \\ N \end{array} \right\}$ CO. COOH, according the author, and called by him isatoic acid. The acid is slightly soluble in

water and alcohol when cold, more easily when hot, crystallizes from water in long needles, from alcohol in yellow, rhombic plates, decomposes when heated beyond its melting point or by prolonged boiling in water, yielding carbon dioxide and other products. This acid can also be gotten directly from indigo-blue by oxidation with chromic acid under glacial acetic acid. (*Jour. f. prakt. Chem.*, **30**, 87). F. P. V.

Betain in Cotton-seed Cake. H. RITTHAUSEN AND F. WEGER.

The mother liquor from which melitose has been extracted, dissolved in 90 p. c. alcohol, gives with platinum chloride a crystalline precipitate. This is dissolved in water, treated with sulphuretted hydrogen and the clear solution evaporated to dryness. The residue is treated with a little water, neutralized with barium hydrate and the filtrate treated with alcohol. To get rid of barium and potassium chloride, still present, the alcohol was distilled off and replaced by absolute alcohol. Some chloride was still retained however. By fractional precipitation with hydrochloric acid, a nearly pure fraction of the hydrochloric acid compound with the base was obtained. This is very soluble in water and crystallizes in large colorless crystals, melts when heated on platinum foil, with white smoke and smell of trimethylamine, then burns with pale blue flame. Analyses lead to the formula $C_5H_{12}NO_2Cl$, and for the base $C_5H_{11}NO_2$. The compounds with gold chloride and with platinum chloride were prepared and examined. From the experiments made, the body seemed identical with betain. Whether this base occurs as such in the cotton seed or is produced by the treatment, is undecided as yet, though the authors are engaged upon the solution of the question. (*Jour. f. prakt. Chem.*, **30**, 36.)
F. P. V.

Action of Allyl Iodide, Butyl Iodide and Zinc upon Acetone. E. SCHATZKY.

A mixture of acetone, allyl iodide and butyl iodide is dropped upon zinc. At the end of the reaction heat is applied. The oil obtained yields, on fractionating, a large amount of allyldimethylcarbinol, and, in smaller quantity, a substance with the boiling point 192°–196°, appearing from the analysis to be $C_{10}H_{20}O$, or allyldimethylcarbinol, in which one atom of hydrogen is substituted by the butyl radical. (*Jour. f. prakt. Chem.*, **30**, 216.) F. P. V.

On the Oxidation of Purpurine. C. DRALLE.

It is a well known fact that purpurine derived from the madder root is not nearly so stable against the action of oxidizing agents, as its synthetically prepared isomers. Schunk and Römer (*Ber. d. chem. Gesell*, 10, 175) found that a solution of purpurine in caustic potash, when exposed to the sunlight, soon becomes decolorized. The product formed in this reaction, however, was not previously known. This experiment was repeated by the author who succeeded in extracting from the reaction product with ether, a compound which he found to be phthalic acid. This was verified by the melting point of the anhydride (128° C.), the melting point of the inside (226° C.) and the fluoresceine reaction with resorcine.

Phthalic acid was also obtained by oxidizing an alkaline solution of purpurine with potassium ferricyanide. Chinizarine yields with the same reaction also phthalic acid, while alizarine does not. (*Ber. d. chem. Gesell*, *1885*, 376.)   J. H. S., jr.

On Hydrazobenzole and Benzidine. D. STERN.

The changes produced by the action of the chlorides and anhydrides of acids upon hydrazobenzole, have, up to the present time, been very little examined.

If hydrazobenzole and benzoylchloride are slightly heated, a dark-colored mass is obtained, which is insoluble in water. On purification this was found to be dibenzoylbenzidine.

$$C_6H_5N—C_7H_5O$$
$$|$$
$$C_6H_5N—C_7H_5O$$
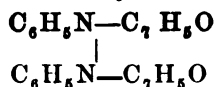
Hydrazobenzole on being treated in the same manner with formic acid, yields a compound possessing properties similar to dibenzoylbenzidine. On analysis it was found to consist of diformylbenzidine.

$$C_{14}H_{12}N_2^{\prime}O_2= \begin{array}{l} C_6H_4NH.CHO \\ | \\ C_6H_4NH.CHO \end{array}$$
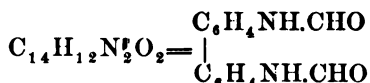
Hydrazobenzole and acetic anhydride on being mixed together in the cold yield monoacetylhydrozobenzole.

On heating this compound with acetic anhydride, it is converted into diacetylhydrazobenzole. Benzoylchloride converts monacetylhydrazobenzole into dibenzoylbenzidine. (*Ber. d. chem. Gesell*, *1885*, 379.)   J. H. S., JR.

The Hydrocarbon, C_8H_{14}, obtained from Allyldiethylcarbinol. REFORMATSKY.

This hydrocarbon is gotten by the action of dilute sulphuric acid upon allyldiethylcarbinol. It is a colorless, mobile liquid with the characteristic odor of the fatty series, insoluble in water, easily soluble in alcohol, ether and benzol, and boils at 122°–123°. The vapor density is 3.81, and the specific gravity at 18° (water at 20°) is .7572. It oxidizes slowly in the air. When oxidized by means of potassium dichromate and sulphuric acid, it yields principally propionic and acetic acids along with some formic acid. It combines energetically with bromine, although, in the experiments made, hydrobromic acid was always evolved. (*Jour. f. prakt. Chem.*, **30**, 217.)   F. P. V.

Simple method for the Preparation of Anthranilic Acid. H. KOLBE.

On heating isatoic acid with strong aqueous hydrochloric acid upon a water-bath, is decomposed into carbon dioxide and anthranilic acid, which is left, after evaporation to dryness, combined with hydrochloric acid as a white crystalline mass. Large, colorless crystals may be gotten by crystallizing out of hot water. The aqueous solution is precipitated with ammonia, neutralized with acetic acid, and may be treated with animal charcoal and recrystallized. That which fails to be precipitated by ammonia may be gotten as a blue precipitate with copper acetate, which is then decomposed with sulphuretted hydrogen. The yield is near the theoretical amount. (*Jour. f. prakt. Chem.*, 30, 125.)   F. P. V.

On Haematoxylin and Brasilin. CHR. DRALLE.

This investigation was undertaken with the view of learning whether, by the action of certain re-agents on haematoxylin and brasilin, compounds might be obtained, from which the structure of these two bodies might be ascertained. The authors, however, did not succeed in accomplishing this, and merely publish the results of their experiments, in order that other chemists may not be obliged to go over the same ground. (*Ber. d. chem. Gesell,* *1885*, 372.)

J. H. S., jr.

ANALYTICAL CHEMISTRY.

Volumetric Determination of Nitric Acid. A. LONGI.

Diphenylamine (sulphuric acid solution) is added in very small quantity to a mixture of the solution of nitrate and from 3 to 4 volumes of concentrated sulphuric acid. The resulting deep blue color disappears on adding a definite amount of a solution of potassium stannous sulphate. This solution is prepared by taking the salt $K_2Sn(SO_4)_2$ and dissolving it in sulphuric acid (diluted one-half), effecting complete solution by means of the least possible quantity of hydrochloric acid. The reduction of the nitric acid in the nitrate is as follows :

$$4SnSO_4 + 2H_2SO_4 + 2HNO_3 = 4Sn (SO_4)_2 + 5H_2O + N_2O.$$
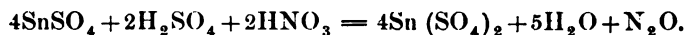
The method is not applicable when ferric salts are present in considerable quantity, nor for large amounts of nitric acid, on account of the quantity of sulphuric acid which must be added. The author, in his experiments, made use of dilute solutions containing less than .04 grms. of potassium nitrate. (*Zeit. f. anal. Chem.*, **24,** *23*.) F. P. V.

Notes on the Detection of Nitrous and Nitric Acids. R. WARRINGTON.

A study of the relative values and degrees of delicacy of the different tests.

Nitrous Acid.—The Naphthylamine test (Griess') is sensitive to one part of nitrogen as nitrate in 1000 millions of water ; the iodide test reaches its limit at 1:200 millions, the paraamidobenzeneazo-dimethylaniline test (R. Meldola) at 1:100 millions.

Detection of Nitrous and Nitric Acid.—Of tests serving to indicate presence of one or both of these acids without distinguishing between them, the ferrous sulphate test distinguishes one part (of nitrogen as above) in 300,000. The indigo test is sensitive also to the presence of other oxidizing substances, and is modified or annulled by presence of sugar, urea, and other organic matters which apparently are oxidized in preference to indigo during the necessary heating. The brucine test, applied as recommended by the author, *i. e.*, by keeping down the temperature and adding strong sulphuric acid very gradually, will detect one part N

as nitrate in 20 millions, and one part as nitrite in 10 millions. With the method recommended by Nicholson, still greater delicacy is possible. The diphenylamine test is sensitive to one part of nitrogen (nitric or nitrous) in 10 millions.

The detection of nitric acid in presence of nitrous acid is more difficult than the converse, and the author knows of no certain method by which it can be accomplished. (*Chem. News*, 51, 39.)

A A. B.

Lead Assay in the Wet Way. C. ROESSLER.

The method of Storer (*Chem. News, 1870, 137*) is open to objection on account of the easy oxidation of the spongy lead and the retention of particles of unaltered galena. The author proposes to substitute the following : The galena is first decomposed with boiling hydrochloric acid and the lead then precipitated by means of zinc. The spongy lead is then dissolved in a pellet of Wood's metal fused under slightly acid water. The increase of weight in the pellet gives the amount of lead taken up. It is capable of dissolving half its weight. The pellet must be rapidly and carefully cooled to prevent its becoming porous and absorbing water. It should be cooled by pouring in cold water when itself not much above its melting point. Veinstone and earthy matters are left behind. The presence of copper necessitates a precipitation and separation of the lead as sulphate before applying this method. Antimony must be separated by precipitation with sodium hydrosulphide, or, if the antimony and lead are together in hydrochloric acid solution, by evaporating to dryness and volitizing the antimony chloride. From test experiments the method seems rapid and fairly accurate. (*Zeit. f. anal. Chem.*, 24, 1.)   F. P. V.

Identification of Caramel. C. AMTHOR.

If paraldehyde be added to alcoholic liquids colored with caramel, a brown precipitate is given, and if enough be used the liquid is decolorized. Natural wines, whether white or deeply colored, give white precipitates. Again, if the amount of caramel is not too small, a solution of phenylhydrazine causes a brown precipitate to settle out after twelve hours' standing (the precipitation commences immediately). This reaction is hastened by heating on a

water bath. In practice the brown precipitate with paraldehyde may be dissolved in hot water and tested with phenylhydrazine. (*Zeit. f. anal. Chem.*, 24, *30.*)   F. P. V.

Determination of Extract in Wine.   C. WEIGELT-RUFACH.

The usual method of evaporating 50 c.c. and weighing the residue is, for wines rich in extract, open to the errors of imperfect drying and loss of glycerine and easily decomposable organic acids during the prolonged heating. It is suggested that an approximate determination be made and then the wine diluted so as to bring its proportion of extract to about the usual amount (or a correspondingly smaller portion than 50 c.c. may be used), or that the material left after the picnometric determination of alcohol be properly diluted and used. The usual method does not seem accurate when the extract is 2 p. c. or over.   (*Zeit. f. anal. Chemie.*, 24, *23.*)   F. P. V.

Examination of certain Musts for Sugar and Acid. . E. SCHMIDT.

The author has examined the vintage of Montreux and Villeneuve for the contents of sugar and acid from 1880 to 1884, and presents them in a tabulated form. (*Zeit. f. anal. Chem.*, 24, *33.*)
F. P. V.

INDUSTRIAL CHEMISTRY.

On Aniline Black.   L. LIECHTI and W. SUIDA.

The authors, in an investigation still in progress, find occasion to modify the formula hitherto accepted for aniline black and throw new light upon the process of its development in dyeing. Aniline chlorate, $C_6H_5NH_2HClO_3$, was obtained by reaction between barium chlorate and aniline sulphate. The salt crystallizes in colorless prisms which by exposure to the air are transformed into aniline black (Emeraldine) under the influence of the chloric acid contained in the salt and without the presence of a metal, which has hitherto been considered necessary. The crystals of the new compound retain the form of the old (pseudomorphism), and the absence of intermediate products indicates that the process is one of direct oxidation of aniline.

The solutions of aniline chlorate may be boiled unchanged but yield emeraldine in abundance on heating with addition of HCl or of ferric chloride, aniline chloride or dilute chromic acid mixture. Pure emeraldine is obtained by treating the crystals of aniline black with HCl, alcohol, ether, and dilute KHO in succession. This corresponds to formula $C_{18}H_{15}N_3HCl$, but the true molecular wt. is as yet undetermined. By distillation with zinc dust the authors obtained diphenylphenylendiamine, diphenylamine, diamidodiphenylamine and, in lesser quantity, phenylendiamine, aniline and ammonia.

The authors regard emeraldine as a chlorine substitution product of the base $C_{18}H_{15}N_3$ and not as a hydrochloride of that base; i. e., as $C_{18}H_{14}ClN_3$ and not $C_{18}H_{15}N_3HCl$. The latter formula maintained by Nietzki (1876, **222**, 592), is discredited by the facts that chlorine is not removed from emeraldine by silver oxide, and that the chlorates of heavy metals, such as are used in development of aniline black, furnish, by decomposition, oxides of chlorine which are capable of yielding chlorinated derivatives of organic bodies.

The use of heavy metals in the development of aniline black depends upon the property possessed by their chlorates of setting free HCl, which is the essential condition in the development of aniline black. The regeneration of these chlorates in presence of $KClO_3$ used in the process permits the repeated transfer of HCl, and the minute proportion of the salts of vanadium, copper, etc., required is thus explained. Free HCl decomposes aniline chlorate and produces emeraldine. In a direct experiment in which fibrous material was treated with mixtures of aniline chlorate and hydrochloride the addition of HCl effected rapid development of black at moderate temperatures (31°–35°) while without this addition a temperature of 80°–90° was required, the necessary HCl being then set free from the aniline salts. (*Ding. pol. Jour.*, **254**, 265.)

<div style="text-align:right">A. A. B.</div>

Conversion of Liquid Fat Acids into Solid Products.

The method of St. Cyr. Radison (of Marseilles), for converting oleic acid, a bye-product of the fat industry, into solid palmitic acid rests upon the reaction discovered by Varrentrap in 1841, i. e.,

treatment with fused caustic potash in large excess, whereby potassium palmitate and acetate and free hydrogen are produced.

$$C_{18}H_{34}O_2 + 2KOH = C_{16}H_{31}KO_2 + C_2H_3KO_2 + H_2$$
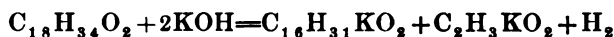
The operation is carried out in a decomposing vessel of wrought iron with cast iron bottom heated over an open fire, with a large fire space in order that the necessary temperature may be uniformly maintained.

In the process of W. L. Carpenter (J. Soc. Ch. Ind., 1884–200), a closed pan provided with manhole, safety valve, gas exit, tube and stirrer is used. The gaseous products are passed through a coke scrubber and thence into a holder. The charge is 1,500 kilos. oleic acid and 2800 KHO solution, sp. gr. 1.4. Decomposition begins at 290° C.; the most favorable temperatures for the operation being from 300°–310°. At 320° destructive distillation begins and steam is blown in as a preventive measure when this temperature is reached. The process lasts 36–40 hours. The end of the reaction is ascertained by testing the fusing point of the palmitic acid produced, using the method of Dalican. (*Ding. pol. Jour.*, **254**, 264.) A. A. B.

Preparation of Barium and Strontium Hydrate.

Leplay's method (D. R. P., 28,757, Oct. 13, 1883), depends upon the action of superheated steam upon the highly heated carbonates of these bases, which have previously been moulded into balls or cylinders. The material is heated to a red heat and the temperature of the steam must, in all cases, exceed 110° C. The hydrates are formed at temperatures above their fusing points and flow off into appropriate vessels as fast as formed. The fused hydrates, however, dissolve about 25% of their respective carbonates without becoming infusible. The separation of the hydrates from undecomposed carbonate is facilitated by adding caustic alkalies to the water used to mix with the pulverized carbonate before moulding it into cylinders. The temperature of decomposition of the carbonates lies near the fusing point of cast iron. By the substitution of alkaline carbonates for the caustic alkalies used above, the process may be made to yield alkaline hydrates also. Barium and strontium hydrates, being practically insoluble in caustic alkalies, are readily separated from the latter by water. (*Ding. pol. Jour.*, **254**, 436.) A. A. B.

The Fusion, Casting, etc., of Iridium. N. W. Perry.

An extended description of the iridium industry as recently developed by the introduction of the Holland process, together with many practical details and an index to the literature of iridium. (*Chem. News*, 51, 1.)   A. A. B.

On Some New Paraffins. K. B. Sorabji.

Cetane, $C_{16}H_{34}$, made from cetyl iodide by action of zinc and fuming HCl, is a crystalline solid fusing at 19–20°, boiling at 278° and yielding vapor density 7.85–7.90. Theory requires 7.84.

Dicetyl, $C_{32}H_{66}$, and diheptyl, $C_{14}H_{30}$, were prepared by the method of Wurtz ; action of sodium upon iodides of the alcohol radicles. Dicetyl crystallizes in pearly scales from its solution in acetic acid ; fuses at 70°, boils at a temperature far above the range of the mercury thermometer, distills unchanged and is not dissolved or blackened by strong sulphuric acid at 150°. Vapor density found, 16.1–15.64, calculated 15.5. Diheptyl is a colorless, mobile oil, having a slight odor, solidifying at 6°, boiling at 245°, at 750 m. m. without decomposition, and yields a vapor density of 7.06–7.04. Theory 6.82. (*J. Ch. Soc.*, 266, 37.)   A. A. B.

Abstracts of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

February 3, 1885.

311,470.—Composition for preserving eggs.—C. U. Chamberlin.

Consists of alcohol, crystals of salicylic acid, deodorized wood-naphtha, bleached resin-lac and powdered chalk.

311,483.—Apparatus for manufacturing gas.—A. O. Granger and J. H. Collins, Jr.

Water gas is made by the decomposition of steam in contact with heated carbon in a furnace, and such gas is passed into the bottom of a vertical heated flue or chamber, and is therein enriched or carbureted with hydrocarbon vapor sprayed in at the top of the flue. The carbureted gas is fixed in the heated flues of the fixing chamber.

311,484.—Gas-generating apparatus.—A. O. Granger.

311,493.—Apparatus for generating gas.—I. James.

311,506.—Refrigerating machine.—C. G. Mayer.

311,529.—Lubricant.—II. Riedel.

Consists of mineral oil, boiled linseed oil and powdered plumbago.

311,542.—Process of refining, reducing and separating hydrocarbon oils.—E. W. Strain.

The oils are first subjected in transit and under pressure to heat which will vaporize them, then the oil is sprayed into an expansion chamber in the presence of superheated steam, where the oil and vapors are separated, and, finally, the vapors are conducted through a surface or air condenser, where the vapors of different degrees of gravity are trapped and separated at the points of condensation.

311,555.—Composition for soap.—H. Zahn.

Claims the use of a silicious, alkaline earth in soap making.

311,569.—Composite roofing.—W. Coultas.

A covering for boilers, roofs, etc., consisting of an argillaceous paste or plaster, mixed with fibrous material and soot. The composition is coated with tar after being applied.

311,583.—Inextinguishable lamp for marine and land purposes.—J. R. Holmes.

311,585.—Hydraulic main for gas works.—C. W. Isbell.

311,590.—Method of and apparatus for mashing and cooking grain.—F. O. Kinz.

311,595.—Production of sulphurous acid.—J. S. McDougall.

Sulphurous acid is produced by forcing air under pressure into a close vessel or retort, containing ignited sulphur or sulphur bearing material, a low temperature being maintained in the vessel or retort, by surrounding it with a cooling medium.

811,646.—Liquefaction, dextrination and saccharification, by means of malt of the starch in amylaceous substances.—L. Cuisinier.

811,694.—Apparatus for the manufacture of artificial stone.—C. I. Walker.

311,699.—Apparatus for recovering volatilized metals.—A. F. Wendt.

811,748.—Metal-extracting apparatus.—W. Hamilton.

811,749.—Metal-extracting apparatus.—W. Hamilton.

811,750.—Covering for steam pipes.—J. M. Hammill.
Consists of superposed layers of paper or other material having granulated cork adhesively applied.

811,799.—Heater and evaporator for syrup and other liquids.—H. Y. y Lazarte and E. P. Larée.

811,082.—Puddling and heating furnace.—T. H. Bennett.

811,804.—Calcining and chloridizing furnace.—W. H. H. Bowers.

811,830.—Manufacture of iron and steel.—J. Grottenthaler.
The iron is purified and decarburized by melting, adding sulphur and mixing it therewith by puddling.

811,858.—Gas machine.—W. C. Strong.

February 10th, 1885.

811,878.—Magma pump.—Geo. Dinkel.
This is a pump for pumping semi-fluid masses.

811,895.—Manufacture of hydraulic cement.—D. Griffiths.
To the calcined cement-rock or hydraulic limestone, is added some of the raw rock containing silica and slaked lime.

811,938.—Paper for roofing felt.—C. W. Armour.

811,983.—Paper for sheathing, &c.—C. W. Armour.
The paper is made of spent tan bark, meadow hay and mill waste, and is covered on both sides with a layer of paper pulp.

811,967.—Method of an apparatus for enriching and burning water gas.— C. J. Eames.
This is a process for applying water gas in metallurgical operations.

811,998.—Process of filling bottles with aerated beverages.—G. Matthews.

812,010.—Protected nitrate of ammonia for use in explosive compounds.— R. S. Penniman.
Nitrate of ammonia is protected against deliquescence by a coating of petroleum or its products.

812,037.—Sectional non-conductive covering for tubes.—W. M. Suhr.
A tube covering consisting of plaster of Paris, asbestus and sawdust, covered on the outside with felt.

312,045.—Process of annealing copper wire.—W. Wallace and T. J. Wood.

Coils of wire are packed in pots with oxide of copper, and heated in the annealing furnace.

312,057.—Composition for the manufacture of artificial stone.—J. L. Wray.

Consists of water, lime, alum, glue and common mortar.

312,106.—Gas meter.—Gustav Fajen.

312,142.—Method for deoxidizing the surface of sheet metal.—E. V. Mc-Candless.

The oxidized iron or steel plates are heated in a current of natural gas, or other deoxidizing gas.

312,186.—Apparatus for caburetting air and gas.—J. S. Butler.

312,187.—Filter.—C. De Los Rios.

312,240.—Amalgamator.—R. J. Atcherley.

February 17, 1885.

312,248.—Manufacture of potassium ferrocyanide.—H. Bower.

Nitrogenous animal matters, potassium carbonate and iron are mixed together and heated. The resulting melt is treated with water, and carbon dioxide.

312,270.—Insecticide.—J. B. Hoag.

Consists of cayenne pepper, American hellebore root, Paris green, sugar and carbolic acid.

312,281.—Filter.—J. Mallie.

312,289.—Air or gas carburetor.—J. M. Palmer.

312,333.—Apparatus for separating or concentrating material of different specific gravities.—A. E. Crow and W. L. Crow.

312,341.—Apparatus for drying starch.—W. Duyrea.

The starch is dried on endless aprons, in chambers heated by hot air.

312,342.—Apparatus for drying the bye-products of starch manufacture and other vegetable matters.—W. Duryea.

312,351.—Process of oxidizing linseed and other oils.—J. W. Hoard and F. R. Hoard.

The oil is oxidized by passing and repassing it, by the agency of a blast of air through an atomizer, within the vessel containing the liquid under treatment.

312,356.—Artificial stone.—J. D. King.

Consists of sand, cement, water, soluble glass, borax, saltpetre, dried alum and salt.

312,418.—Manufacture of linseed and other oils.—H. F. Jaryan.

The oil is extracted by solvents and filtered through animal charcoal in the cold, for the purpose of bleaching and deodorizing it.

812,422.—Glass melting furnace.—G. H. Benjamin.

812,431.—Gas apparatus.—W. M. Casler.

Coal is distilled, and the resulting gas is enriched or carbureted with the vapor of hydrocarbon oil, the oil being admitted to the retort containing the coal by a supply pipe. The gas, after leaving the retorts, is purified by passage through a mixture of sawdust, iron filings and salt.

812,510.—Sorghum evaporator.—D. Rather, Jr., and S. Rather.

812,525.—Bleaching compound for jute, paper stock, etc.—P. Souders, C. Smith, H. M. Craighead and N. Souders.

The stock is mixed with a composition of alum and clay, raised to steam heat, and bleaching powder is then added.

812,527.—Filter.—F. X. Spitznagel.

812,586.—Process of preparing ores for amalgamation and desulphurizing the same.—C. R. Squire.

The ore is prepared and desulphurized by immersing in a solution of salt-cake.

812,587.—Treatment of ores for amalgamation.—C. R. Squire.

The ore is desulphurized by subjecting to a mixture of a solution of salt-cake and a solution of nitre-cake.

812,592.—Apparatus for treating the refuse from breweries.—F. W. Wiesebrock.

812,593.—Preserving brewers' grain.—F. W. Wiesebrock.

The refuse from starch and glucose factories and breweries, is first treated with an antiseptic, and then dried by forced currents of air, heated to a high temperature.   W. R.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—held March 6th, 1884.

Dr. A. R. Leeds in the chair.

The minutes of the meeting of Febuary 6th were read and approved.

Dr. Waller reported that $176.50 had been received for the Watts Fund, and gave a synopsis of a letter received from Dr. Atkinson in which it was stated that the amount subscribed in England, up to February 1st, was £1,469.

Dr. T. Sterry Hunt was substituted for Prof. S.W. Johnson on the Silliman Memorial Committee.

Mr. S. W. Williams of 72 William street, New York City, was elected a member.

The resignation of Stewart C. Squier, Associate Member, was read and accepted.

Dr. C. A. Doremus read a paper on "A simple apparatus for the rapid estimation of Urea."

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

THE WATTS' SUBSCRIPTION.

Dr. E. Waller announces the following subscriptions to the Watts Fund, up to March 6th, 1885:

Dr. J. C. Booth	$10 00	A. L. Colby	$5 00
Prof. F. P. Dunnington	10 00	Prof. S. W. Johnson	5 00
G. W. Riggs	5 00	E. S. Wood, M.D	5 00
H. Holt	10 00	Prof. F. H. Storer	25 00
J. B. Mackintosh	10 00	Prof. G. F. Barker	5 00
E. W. M	2 50	S. A. N	1 00
A. A. Breneman	5 00	"W"	8 00
"F. C. S."	5 00	Prof. Henry Morton	10 00
M. E. Waldstein	5 00	P. F	5 00
G. Miller	5 00	Dr. Alfred Springer	10 00
P. Casamajor	5 00	Prof. H. B. Cornwall	5 00
Prof. A. R. Leeds	5 00	J. H. Stebbins, Jr	2 00
Dr. E. R. Squibb	5 00	Dr. C. F. Chandler	25 00

A SIMPLE APPARATUS FOR THE RAPID ESTIMATION OF UREA.

By Charles A. Doremus, M.D., Ph.D.

Of the many methods that have been suggested for the estimation of this most important constituent of urine only two have practically survived. Liebig's method of precipitating the urea with mercuric nitrate and Davey's of decomposing the urea with sodium hypochlorite, the latter subsequently modified by Knop, who used sodium hypobromite, are the only ones that we find given in works on urniary analysis of recent date. It is not so much on account of their superiority but of their convenience, that these have outlived other processes. Next to the determination of the presence or absence of albumen and sugar there is no one constituent the variation of whose excretion it is more important to know than that of the urea. This is especially the case since we have no exact, rapid method of ascertaining the quantity of albumen voided, and, in cases of Bright's disease a determination of the elimination of the urea becomes a matter of moment.

For several years past the modification of Davey's method suggested by Dr. Williams has been in use in the laboratory of the Bellevue Hospital Medical College. The apparatus is very simple, consisting of a graduated burette connected with a double bulb apparatus by a rubber tube. A measured quantity of urine is placed in one bulb and several times its volume of hypobromite in the other. The bulb apparatus is then connected with the burette which is placed in a tall jar of water.

The level of the water inside the burette and out is equalized and the point at which it stands noted. The urine is then gradually mixed with the hypobromite and the increase in volume of gas in the apparatus, due to the evolution of nitrogen, measured on the burette. The multiplication of the number of cubic centimeters by the factor 0.0027 gives the weight of urea in grams. A further calculation gives either the percentage or the total quantity voided in 24 hours.

To lessen the cost of an outfit for urinary analysis the above apparatus was arranged in such a way that only one piece, the bulb part, was exclusively used for this determination. The burette served as a measure for all quantitative volumetric operations as did also the graduate jar. But the apparatus, simple as it is, has

its inconveniences as any one would soon ascertain in the practical use of it in laboratory instruction.   For the practitioner of medicine it is not always in order and the determination takes time.   A calculation is necessary even though a table is frequently given to which the operator may refer.   The leveling of the water is annoying and though the determination can be made more accurately when corrections for temperature and pressure are used in the calculation than with the process to be described, as it is practically carried out, there is scarcely any advantage.

Recently Dr. E. R. Squibbs * has published a description of an apparatus which he commends for use in hospitals and private practice since the necessary parts are easily obtained and the execution of the test simple enough to entrust it to a nurse or orderly.

The general form of the apparatus shown in the cut is not new.   It was in use in Prof. Kuehne's laboratory in Heidelberg in 1871, where it was employed in the detection of fermentable sugars by introducing some yeast in the liquid and setting the tube in a warm place.   The carbon dioxide evolved collected in the long arm.

Since then it has been given in works on animal chemistry.

Rough trials with an extemporized apparatus led to the ordering of a tube graduated in cubic centimeters.   Further experiments with this caused the change in the graduation, which is now made to read either fractions of a gram of urea in a cubic centimeter of urine or the number of grains per fluid ounce of urine.
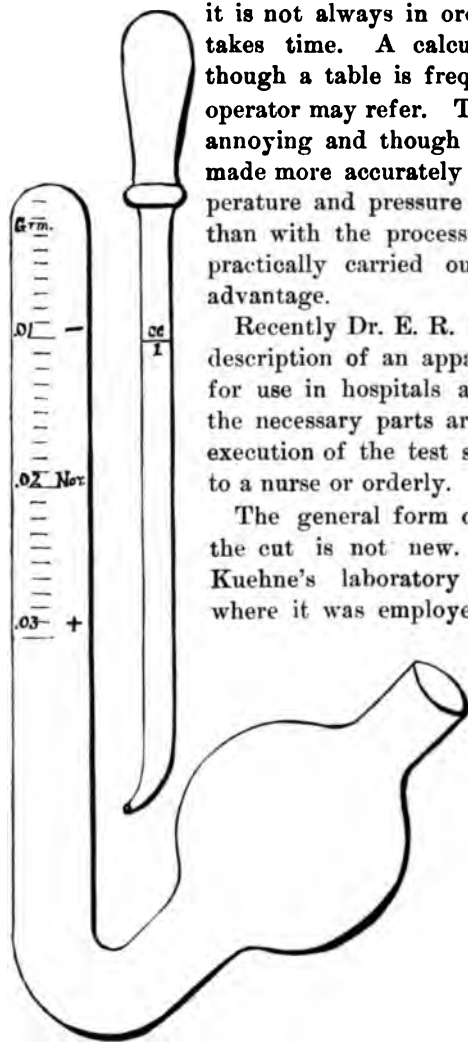
Fig. 9.

* Ephemeris, Vol. II., p. 438, 1884.

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BY CHARLES A. DOREMUS, M.D., PH.D.

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for urea as
self at least

Dr. Geo. B. Fowler's method † which needs but a urinometer for the measurement of the loss of gravity a urine mixed with hypobromite or hypochlorite sustains by the escape of nitrogen, is extremely simple, but requires time for the execution of the test and a calculation, which, to the average medical man, is repugnant.

A solution of sodium hydrate, made by dissolving 100 grams of the solid in 250 c. c. of water (or, for those who prefer the apothecary's measures, 6 oz. to the pint of water), is kept on hand in a bottle with a paraffined or rubber stopper.

With this a solution of hypobromite is freshly made by adding 25 c. c. of bromine, cooling and diluting to 500 c. c. with water. Enough of the hypobromite is poured into the bulb of the ureometer to fill the long arm and the bend when the apparatus is tilted.

1 c. c. of urine is drawn into the nipple pipette and delivered slowly, by pressing the nipple, through the hypobromite into the long arm of the ureometer. The urine rises through the hypobromite and the decomposition of the urea is instantly affected. With good hypobromite very little gas either escapes from the long arm or is disengaged after three or four minutes standing. The reading of the instrument gives at once the quantity of urea, if in grams, in 1 c. c. of urine, if in grains, then per fluid ounce.

When the centesimal scale is used, multiplying the result by 100 gives the so-called percentage. This is really not correct but is the weight of urea in 100 c. c. of urine. When the Sp. Gr. of the urine is known, the percentage by weight may be quickly calculated.

The graduation of the instrument to indicate weight of urea does away with tables or calculations. Usually the test is sufficiently accurate not to require the reading of the temperature or the lowering of the ureometer in water, to eliminate the error due to difference in level in the liquid in the two arms of the apparatus. The instrument is graduated on the practical basis ascertained by Russell and West * for 65° F.

As the hypobromite deteriorates, it is wise to make up small quantities at a time. For this purpose one volume of bromine is added to 10 volumes of sodium hydrate and subsequently mixed with 10 of water.

For convenience the ureometer may be filled to the mark = with sodium hydrate, 1 c. c. of bromine is then added by means of the

† *N. Y. Med. Jour.*, June, 1877.

nipple pipette and, when it has combined with the soda, enough water is added to fill the long arm and bend of the ureometer.

Other solutions which decompose urea with evolution of either nitrogen or nitrogen and carbon dioxide may be employed instead of the hypobromite but offer no practical advantage.

In hospitals a fresh daily supply of hypobromite can be ordered for general use and perhaps through the use of some such speedy yet fairly accurate method as this our information concerning the elimination of what is, by all odds, the most important constituent of the urine will be largely increased. To the office practitioner it offers a ready, cleanly and rapid method of analysis and to the general practioner, a substitute for even so simple a test for urea as the mere addition of nitric acid, one which commends itself at least on the score of rapidity and approximate accuracy.

*Jour. Chem. Soc., **12**, 1874, 749.*

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

On the Purple Colors Derived from Gold. M. MÜLLER.

The author gives a historical sketch of former writings on this subject and mentions the two theories of the formation of "Purple of Cassius." The one maintained by Gay-Lussac, Proust and Debray, ascribed the color to metallic gold in minute division; the other considered it due to the presence of an oxide of gold, and numbered among its supporters Berzelins, Strecker, and others. J. C. Fisher claimed to have discovered a red modification of the metal, which the author, however, believes to have been nothing more than ordinary gold in a finely divided state. He maintains that, in the thinnest possible films, the metal is transparent for the red rays only, and explains the green color seen through gold foil by transmitted light as a phenomenon of optical interference. If the color of the Purple of Cassius is owing to the finely divided metal, a number of analogous products might be formed. Of such he prepared a considerable number, the gold being precipitated on various insoluble bases. Magnesium oxide, suspended in water, being heated with a solution of chloride of gold to near the boiling point, the metal is precipitated on the base in combination with oxygen. A pale yellow precipitate is obtained, which, after repeated washing with water, yields, when heated to redness a fine purple-red pigment. The water of hydration is expelled from the magnesia, the oxide of gold being at the same time reduced to the metallic state. In order to exclude the possibility of an imperfect reduction, the preparation was heated in a current of hydrogen, but the color was not thereby destroyed. For this reason the author decides in favor of the Gay-Lussac theory. Similar results were obtained when using lime, alumina and other bases, the compounds so prepared surpassing in brillancy the well known Purple of Cassius. The author is making experiments with a view to determine how far other metals, especially copper and silver, possess the power of coloring white bases, when precipitated on these in a finely divided state. (*Jour. prakt. Chem.*, **30**, *252*.)   H. M. R.

On Metallic Gallium. L. EHRLICH.

Gallium was discovered by Lecoq de Boisbaudran in 1875, in a zinc ore from Pierrefitte, and afterwards found in a variety of blende from Bensberg-on-the-Rhine. The author was the first to prepare the metal in Germany for commercial purposes in the establishment of Dr. Schuchardt. In a preliminary experiment 0.6 grm. of the metal was obtained from 80 kilos of zinc blende. Certain improvements in the process made it possible to extract, within 2–3 days, the gallium contained in 6 cwts. of the mineral. The melting point of the metal is 30.5° and its lustre exceeds that of mercury. (*Chem. Zeit.*, **9**, 78.)   H. M. R.

Differential Dilatometer and its Use in Examinations on the Formation of Alums. W. SPRING. (*Ber. d. ch. Ges.*, *1884*, 404.)   J. H. S., JR.

On the Expansion of the Alums. W. SPRING. (*Ber. d. ch. Ges.*, *1884*, 408.)   J. H. S., JR.

Influence of Sunlight on the Vitality of the Germs of Microbes. E. DUCLAUX.

"Air and sunlight are considered as having great influence on private and public health, but the measure of their influence was impossible while the vague ideas formerly held on the nature of epidemic and contagious diseases prevailed. In our day the part played by microbes in such diseases, becomes better established and more precise from day to day, and it has become useful to solve the following problem: What influence has sunlight in the destruction of atmospheric germs ?"

The author takes into consideration the fact that the germs of aerobean microbes have greater power of resistance than those of the anaerobeans. He made his experiments with germs of *Tyrothrix*, an organism already described by him in his researches on milk. These organisms are destroyers of albuminoids. The species *Tyrothrix scabes* was chosen, as it is easily recognized by its granular aspect. This microbe was cultivated in milk, previously sterilized. Five droplets of this cultivation were placed in a number of sterilized flasks, one droplet to each flask. These flasks were covered with sterilized cotton to allow free access of air. Some of

these flasks was exposed to sunlight, while others were placed in a stove and kept at the same temperature as the first, but exposed to diffused light only.

After standing for a certain time, sterilized milk was introduced into each flask. The earliest experiments date three years back, and during that time, not one of the flasks kept heated, but not exposed to direct sunlight, has been sterilized. The spores of *Tyrothrix scabes* preserve their vitality for at least three years, under the combined influence of the action of air and of a tropical heat.

As to the flasks exposed to sunlight, those exposed for two weeks to an August sun showed no decrease of vitality. After exposure to sunlight for one month, there was a decrease in the vitality of the cultivations. After two months of exposure, two flasks in four had become sterile. With Liebig's extract the progression was more marked. One flask in three became sterile at the end of two weeks, two flasks in three at the end of a month and three flasks in three at the end of two months.

Sunlight is then a powerful agent in the destruction of the germs of microbes. (*Comptes Rend.* 100, 119.)   P. C.

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ORGANIC CHEMISTRY.

On the Synthesis of the Alkaloids. G. H. SKRAUP.

The vegetable alkaloids are at present the most prominent subject of chemical investigation, and the general impression seems to prevail that their synthetical production will soon be accomplished. While it is unquestionable that every compound produced in the vegetable organism may ultimately be obtained artificially, a knowledge of the constitution of these compounds must first be gained. The most important result of recent investigations in this field is the demonstration that many of the alkaloids are definitely, others very probably, to be considered derivatives of quinoline and pyridine. Thus quinine, upon oxydation with chromic acid, yields quinic acid $C_{11}H_9NO_3$. It was a fair presumption to look upon this compound as a derivative of quinoline in which one H atom of quinoline is replaced by carboxyl, COOH, and another H by the methoxyl group CH_3O, inasmuch as cinchonine when sim-

ilarly treated, gives rise to cinchonic acid, $C_{10}H_7NO_2$. But as the structural formula of quinoline admits of 42 possible acids of the composition of quinic acid, so derivable, it was to be determined which of the 42 isomers quinic acid really is. A series of investigations which chanced to supplement each other in a very fortunate manner, has almost positively established the structural formula of quinic acid. This has also made it possible to set up a formula for that group in the molecule of quinine which is converted by oxydation into quinic acid. But this is as far as our present knowledge permits us to establish a structural formula for the alkaloid.

Morphine is very probably a derivative of pyridine and stands, at the same time, in close structural relation to the hydrocarbon phenanthrene—but how great the gap between the knowledge of these isolated facts and the artificial production of morphine ?

Atropine, the active principle of belladonna, has been reconstructed synthetically from its decomposition products, tropic acid and tropine. The structure of the former of these is definitely established and tropic acid has been artificially prepared ; on the other hand we are as yet ignorant of the constitution of tropine. There is, therefore, no method at present available for producing atropine, independently of the plant from which it is now obtained.

But granting that the structural composition of the alkaloids were clearly established, their production on a technical scale remains a problem which may never be solved, since it is probable that the materials necessary for the artificial manufacture of the alkaloids would be so costly and the process so complex, that their utilization for commercial purposes would be impossible.

It must be remembered also that in many cases the principle as extracted from the plant possesses certain characteristics, e. g., optical properties, not shown by the same substance when obtained by synthesis. It is therefore not impossible that the alkaloids artificially prepared would not be identical in their physiological effects with those obtained from the plants. The efforts of scientific men in the direction of the artificial production of the alkaloids have nevertheless borne fruit, in that they have led to the discovery of a number of new compounds, such as kairine, antipyrine, and thalline, of considerable value in therapeutics and which have been beneficially applied in numerous special cases of disease. (*Chem. Zeit.*, *9*, *218*, *From Pharm. Post.*) H. M. R.

On the Formation of Ptomaines in Cholera.   A. VIL-LIERS.

The existence of poisonous alkaloids, known as ptomaines in the putrefying bodies of animals, suggests the question whether analogous alkaloids may not be found during life in certain diseases. Led by this suggestion, the author undertook, in November, 1884, an investigation upon the bodies of two men who had died of cholera in Paris. The subjects were both of the same age, 63 years ; one had died after five days' illness, the other after an illness of one day only. The organs of each were examined within 24 hours after death, and the results as given here were identical in the two cases. Using the method of Stas for separation of the alkaloids, the author obtained a substance plainly characterized by alkaline reaction and other properties of an alkaloid. The alkaloid was most abundant in the intestines from which a quantity equivalent to .02 grm. of its hydrochloride was obtained. The kidneys contained well marked traces, the liver and the blood of the heart scarcely any.

The alkaloid is a liquid having an acid taste, and the odor of hawthorne. It is an energetic base, acts readily upon litmus, and is not liberated by alkaline carbonates, but only by caustic alkalies. Its solution yields a white precipitate with mercury-potassium iodide. Potassium iodide yields a brown precipitate, even in solutions so dilute as not to be precipitated by the double iodide ; the reverse is true as to precipitation of alkaloids ordinarily by these reagents.

With bromine water this alkaloid gives a yellow precipitate, with picric acid a yellowish, with gold chloride a yellowish white, and with tannin or mercuric chloride, white precipitates, the last two only in concentrated solutions. It yields reactions characteristic of the ptomaines with ferric chloride and ferricyanides, and acquires a faint and transient violet color when treated with strong sulphuric acid. Its hydrochloride is neutral to litmus and crystallizes in long, transparent, deliquescent needles. (*Comptes. Rend.*, **100**, 91.)   C. E. M.

Certain Derivatives of Mercury Fulminate. (*Preliminary Notice.*) L. SCHOLVIEN.

By the action of dilute sulphuric acid upon sodium fulminate, two acids are formed which are dissolved out by means of ether.

From the ethereal solution there is first deposited a colorless body, crystallizing in needles which gradually becomes yellow. It has acid characteristics and gradually decomposes, forming hydrocyanic acid. It melts at 85°, is easily soluble in water. On evaporating the compound with hydrochloric acid, hydroxylamin hydrochloride is formed. The analysis corresponded nearly to HCNO. The second acid is gotten by spontaneous evaporation of the ethereal mother-liquor. It crystallizes from boiling water, is soluble in alcohol, ether, or hot water, soluble with difficulty in cold water, and gives no precipitates with the metallic salts as the first acid does. Analysis leads to the formula HCNO. Silver fulminate is formed by precipitating sodium fulminate with silver nitrate. On heating this with hydrochloric acid hydroxylamin hydrochlorate is formed. Alkaline and metallic chlorides give double salts having the composition $C_2N_2AgRO_2$. By the action of sulphurea on mercury fulminate a mixture of differently constituted compounds of sulphurea and mercuric sulphocyanide is formed; mercuric sulphide and urea are also formed in abundance. The action is violent and carbon dioxide is evolved. (*Jour. f. prakt. Chem.*, **30,** 92.)   F. P. V.

Synthesis of Vinaconic Acid. F. Röder.

By the action of ethylen bromide upon sodium ethylmalonate and saponification of the resulting ether there is formed an acid melting at 139°, and having the formula $C_6H_6O_4$. This is easily soluble in water and crystallizes in efflorescent crystals with 1 mol. H_2O. It forms two classes of salts, $C_5H_5O_4R$ and $C_5H_4O_4R_2$. The author gives it the name Vinaconic acid. It is isomeric with itaconic acid. It unites readily with hydrobromic acid, giving bromethylmalonic acid, a crystalline body melting at 116°. By boiling the aqueous solution of this, a carbobutyrolactonic acid is formed, which gives with bases two series of salts, $C_5H_5O_4R$ and $C_5H_6O_5R_2$. It is a lactonic acid and the carboxyl, derivative of butyrolactone. Heated to 120° carbon dioxide is evolved and butyrolactone formed. Vinaconic acid when heated a little above its melting point, also gives, as decomposition products, carbon dioxide, butyrolactone and an acid, crystalline substance melting at 18°–19°, boiling at 180°–181°, and having, from analysis of its salts, the formula $C_4H_6O_2$. (*Annalen*, **227,** *13.*)

                                                                 F. P. V.

Camphanic Acid. L. WORINGER.

This acid, first prepared by Wredén, yields on distillation, a new lactone, $C_9H_{14}O_2$, campholactone and an isomeric acid, lauronolic acid. Carbon dioxide is evolved at the same time. Complete de-decomposition of the camphanic acid is brought about only by repeated distillations. A better mode of preparing these new bodies is by heating barium camphanate and water several hours in a closed tube at 200°. The lauronolic acid, $C_9H_{14}O_2$, is mono-basic. On distillation it changes to a small extent into lactone. Campholactone melts at 50° and boils at 230°–235°. (*Annalen*, 227, 1.)   F. P. V.

Constitution of Vinaconic Acid. R. FITTIG.

From its mode of formation this acid is to be looked upon as vinylmalonic acid, with the formula

$$C H_2 = C H - C H \underset{\textstyle\diagdown CO - OH}{\overset{\textstyle\diagup CO - OH}{}}$$
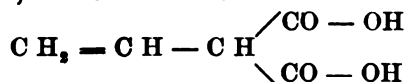
This explains best the easy change into bromethylmalonic acid and carbobutyrolactonic acid. According to this the same formula would have to be ascribed to the monobasic acid $C_4 H_6 O_2$, called vinylacetic acid, as to isocrotonic acid, and yet in properties the two are quite different. The author discusses the probability of this not correctly showing the constitution of isocrotonic acid, and also the plausibility of the assumption of Perkin, Jr., that the vinaconic acid is a trimethylendicarbonic acid.—(*Annalen*, 227, 25.)   F. P. V.

On Dicinchonine. O. HESSE.

This alkaloid is found chiefly in the bark of *Cinchona rosulenta* and *C. succiruba*. In the manufacture of quinine it remains in the mother-liquor, and goes over into chinoidine. *C. rosulenta* contains 0.2 to 0.3 p. c., and is best suited for the extraction of this alkaloid. It cannot be directly prepared from chinoidin. It melts at 40°, has the same percentage composition as cinchonine, but the author ascribes to it the double molecular weight, and hence the formula $C_{38} H_{44} N_4 O_2$. It is easily soluble in ether, aceton, alcohol, chloroform and benzol, less so in water and insoluble in caustic soda.

The alcoholic solution is strongly basic, very bitter, polarizes light to the left, and gives no color with chlorine, nor the alkaline hypochlorites. It dissolves readily in acid, forming salts. Attempts to change it into cinchonicine failed.—(*Annalen*, 227, 153.)

F. P. V.

β—Dipropylacrylic Acid from β—Dipropylethylenlactic Acid. A. ALBITZKY.

Two methods were used in the preparation of this acid. The first consisted in the removal of one molecule of water by the action of phosphorous trichloride, the second in distillation, with sulphuric acid. The pure acid, obtained from some of its well crystallized salts, is a hard, white, crystalline substance, easily soluble in alcohol, ether or benzol, less readily soluble in water. It crystallizes from benzol in radiating needles, melts at 80°, 81°, and solidifies again at 73°. Various salts were prepared by saturating the acid with the carbonates, and were analyzed.—(*Jour. f. prakt. Chem.*, 30, 209.)

F. P. V.

Remarks on Chrysaniline. R. ANSCHÜTZ.

Diacetylchrysaniline. $C_{19}H_{13}N_3 (C_2H_3O_2)$.

In order to determine how many amido- groups chrysaniline contained, it was thought best to test this by forming, if possible, an acetyl compound. For this purpose 1 part of chrysaniline was heated in a sealed glass tube for 8–12 hours with 2½ parts of acetic anhydride. In this way a diacetyl compound was produced. If the acetic acid solution of the base be treated with HCl, diacetylchrysaniline chloride is precipitated in yellow flakes, which, when examined under the microscope, are shown to be composed of long yellow needles. This salt is easily soluble in water, and dilute HCl.

Chrysaniline. $C_{19}H_{15}N_3$.

This was obtained from the acetyl compound by boiling it for 8 hours with HCl (1.12 Sp. Gr.), and then decomposing the chloride formed with NaOH. The strong basic character of the acetylchrysaniline gave rise to the theory that perhaps the third N. atom contained in it might be in the same form as in pyridine or chin-

oline. This question was settled by oxidizing the substance with potassium bichromate and H_2SO_4, acridine being found among the oxidation products. (*Ber. d. chem. Ges., 1884,* 433.)

J. H. S., Jr.

On the Action of Acetic Anhydride and Benzoic Anhydride on Pyrrol. G. L. CIAMICIAN and M. DENSTEDT.

In a previous communication it was shown that pyrrol, when treated with acetic anhydride, formed two isomeric acetyl compounds, of which the one has the properties of a true acetylpyrrol, while the others contained a hydrogen atom replaceable by silver. This compound, which the authors call pseudoacetylpyrrol, is represented by one of the two following formulas :

I
$$C_4H_3=N$$
$$CH_3-COH$$

or

II
$$C_4H_3=NH$$
$$CH_3-CO$$
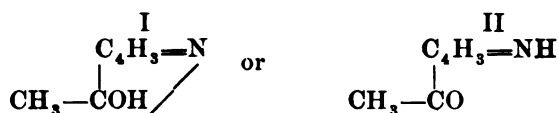
To determine the presence of a carbonyl group, the substance, dissolved in methylalcohol, was heated to boiling with hydroxylamine chloride and sodium carbonate. A compound melting at 145–146° C. was thus formed :

$$C_4H_3=NH$$
$$CH_3-C=NOH$$
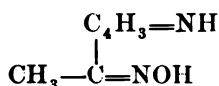
This behavior of the pseudoacetylpyrrol would exclude formula I. Benzoic anhydride reacts similarly to acetic anhydride. (*Ber. d. chem. Ges., 1884,* 432.)   J. H. S., Jr.

On Acridine Picrate. R. ANSCHÜTZ.

This compound was first noticed while purifying some crude phenanthrene with picric acid. Crystallizes from alcohol in fine, microscopic, prismatic needles of a canary yellow color. It dissolves with great difficulty in cold water, and is partly decomposed in boiling water. (*Ber. d. chem. Ges., 1884,* 438.)   J. H. S., Jr.

On Thallin Compounds. G. VULPIUS.

The latest addition to the list of derivatives of chinoline which have been introduced for medical use is a compound which has

been named "Thallin." It is a derivative of parachinanisol $C_9H_6N(OCH_3)$ and is described by its discoverer, Skraup, as a tetrahydroparachinanisol $C_9H_6.H_4.N(OCH_3)$. The sulphate and tartrate of this base appear to have valuable properties as antipyretics. Both these salts are manufactured by the "Badische Anilin and Soda-Fabrik," as white, crystalline powders of a bitter taste and an aromatic odor recalling that of anisaldehyde and cumarine. The most characteristic reaction of the salts of "Thallin" is that with ferric chloride; a solution of one part in ten thousand of water is turned deep emerald green by the addition of a drop of ferric chloride solution. This test distinguishes it from various other compounds similarly employed, such as kairin and antipyrin. (*Chem. Zeit.*, 9, 44, *from Arch. Pharm.*, 21, *840.*) H. M. R.

Preparation of Iodoform, Bromoform and Chloroform by Electrolysis.

An alcoholic solution of potassium iodide is electrolysed in an apparatus, through which a stream of carbonic acid is conducted during the operation. In the electrolysis of potassium bromide and chloride, the current of carbonic acid is not required. (*Germ. Patent 29,223, 1884, from Chem. Zeit.*, 9, 40.) H. M. R.

On the Action of Mustard Oils on the Amido- Acids.
O. Aschan. (*Ber. d. chem. Gesell., 1884,* 420.)

J. H. S., Jr.

Coefficient of Refraction of the Hydrocarbon $C_{12} H_{20}$ from Allyldimethylcarbinol. A. Albitzky.

The specific gravity of this hydrocarbon is .8512 at $0°$. The coefficient of refraction was determined for the lines α, β, and γ, of hydrogen and Frauenhofer's line D. The results, according to the theory of Brühl, would indicate the presence of three double bonds in the hydrocarbon. The portion boiling at $195°-199°$, was taken for this examination.—(*Jour. f. prakt. Chem.*, 30, 213.)

F. P. V.

Examination of Lactose and Galactose. W. H. Kent and B. Tollens.

The authors state, as the principal results of this examination, that to secure the largest yield of mucic acid from lactose one

must act upon 100 gr. lactose, with 1200 c. c. nitric acid (Sp. Gr. 1.15). The yield is 40 per cent. Secondly, lactose yields, on boiling with dilute sulphuric or hydrochloric acids, dextrose as well as galactose. Thirdly, galactose gives, with nitric acid, about 78% mucic acid, and twice as much as was gotten from lactose. On heating with hydrochloric acid, it yields levulinic acid, the formation of which the authors regard as a test for the presence of a carbohydrate. Lastly, on heating mucic acid with water at high temperatures, it is decomposed with the probable formation of dihydromucic acid, pyromucic acid and other substances.—(*Annalen*, 227, 221.)   F. P. V.

On the Synthesis of Piperidine and its Homologues. A. LADENBURG.

The authors have recently described a method of preparing piperidine, obtained by treating pyridine in an alcoholic solution with sodium. The yield, which was very small, has now been much increased by a modification of the process. (*Ber. d. ch. Ges.*, *1884*, 388.)   J. H. S., JR.

Preliminary Notice on the Action of Ammonia on Nitrosophenoles. M. TLINSKI.

If nitroso-β-naphthol is heated 10 minutes in a sealed glass tube with aqueous ammonia, a compound is obtained crystallizing in dark green needles. It dissolves readily in hot alcohol ; melts at 150–152° C., and dissolves readily in acids, but is reprecipitated by dilute alkalies. If the new compound be heated with a strong solution of KOH, a purple-red solution is obtained, which, on further heating gives off ammonia and becomes filled with beautiful green leaflets having a metallic lustre. Acids transform these into yellow needles with silky lustre. The behavior of the new base led the author to believe that a regeneration of nitroso-β-naphthol had taken place. This, on examination, was found to be the case. (*Ber. d. ch. Ges.*, *1884*, 391.)   J. H. S., JR.

On the Action of Hydrochloric Acid upon Amidoazo-Compounds. O. WALLACH and A. KÖLLIKER.

Amidoazobenzol when heated with acetic acid is converted easily into a dyestuff somewhat resembling the indulines. It was found however that strong aqueous HCl produced the same result.

10 parts amidoazobenzol and 100 parts HCl. (1.12 Sp. Gr.)
were heated in a flask with inverted cooler for a few hours. At
the end of this time the amidoazobenzol was found almost com-
pletely decomposed. Steam was now passed through the mixture,
which drove off a crystalline compound along with the distillate.
After purification this body was found to have the melting point
of 129–130° C. The body contains chlorine, and on analysis was
found to be trichlorhydrochinone. The original HCl solution was
next examined and found to contain large quantities of aniline and
paraphenylendiamine. (*Ber. d. ch. Ges., 1884.* 395.) J. H. S., Jr.

On a Few Ethers of Nitrosophenol. J. F. Walker.

The nitrosophenol used in these experiments was prepared in the
following manner : A concentrated solution of one mol. of sodium
ethylate (in alcohol) and one mol. of phenol is treated with one
mol. of amyl nitrate, under constant stirring, then poured into a
flat evaporating dish and placed in the air pump over H_2SO_4.
In a short time nearly the whole mass solidifies into the sodium
salt of nitrosophenol. From this the following compounds were
prepared :

Benzoylnitrosophenol.—Obtained by treating nitrosophenol with
benzoyl chloride. Yellow needles melting, under decomposition,
at 168–175° C.

Ethylcarbonitrosophenol.—Obtained from nitrosophenol and
chlorocarboethylether. Crystallizes in golden yellow needles, M.
P. 109° C. Acetyl chloride also unites with nitrosophenol, but the
resulting compound was very unstable. (*Ber. d. ch. Ges., 1884,*
399.)　　　　　　　　　　　　　　　　　　　J. H. S., Jr.

Phenylisocrotonic Acid and Nitric Acid. (I) Phenyl-nitroethylene. Hugo Erdmann.

Fuming nitric acid reacts at common temperatures on phenyliso-
crotonic acid, causing violent explosions. At 0° C. the nitric acid dis-
solves the phenylisocrotonic acid under evolution of CO_2. To
avoid decomposition, therefore, it is necessary to carry on the ex-
periment at temperatures below 0° C.

10 grms. phenylisocrotonic acid were dissolved in 100 grms. of
cold, fuming nitric acid. The mixture was allowed to rest for a
while and then poured over ice. This precipitates a semi-solid,

light, yellow mass, which was ⁀drained from the mother liquor and
dried on porous plates.   After purification from petroleum ether,
it is finally obtained in beautiful yellow needles, M. P. 58° C.   On
oxidation they form benzoic acid.   This compound was found to be
identical with phenylnitroethylene, $C_6H_5 - CH = CHNO_2$, obtained
from nitroethane and benzaldehyde.   (*Ber. d. ch. Ges. 1884*, 412.)

J. H. S., Jr.

Isomeric Isobutyl-o-amidotoluoles.   J. Effront.

Isobutyl alcohol and o-toluidine chloride on being heated to
280°–300° C. unite, forming isobutyl-o-amidotoluol, $C_6H_3 - CH_3$.
$C_4H_9 - NH_2$.   This base is not, however, identical with Erhardt's
compound.   (*Ber. d. ch. Ges., 1884*, 419.)   J. H. S., Jr.

The Discovery of Cocaine.   C. Lenken.

Discusses the question of the priority of preparation of lhe
alkaloid "Cocaine" from the leaves of *Erythroxylon Coca*.
(*Chem. Zeit.*, 9, 155.)   H. M. R.

ANALYTICAL CHEMISTRY.

Determination of Tartaric Acid in crude Tartar, Argols, etc.   G. Kaemmer.

The writer has critically examined the method recently proposed
by L. Weigert (*Chem. Zeit., 8, 1438*) for the valuation of crude
argols, etc.

He characterizes Weigert's process as a modification of a method
which has been for ten years in ordinary use, and is known as the
"potash method."   The latter employs pearlash to convert the
tartaric acid of the crude materials into neutral potassium tartrate,
from which by means of acetic acid and alcohol it is obtained and
estimated in the form of potassium bitartrate.

R. Warrington (*Journ. Chem. Soc., 1875*) called attention to
certain defects in this process, the alkali acting as a solvent upon
certain coloring matters and foreign substances contained in the
argols, which substances are afterwards precipitated on the potas-
sium bitartrate, rendering it difficult to filter the latter, and causing

errors in the subsequent volumetric estimation. But as the " Oxalic acid method," which Warrington proposed as a substitute, has been found even more deficient, the " Potash method " is commonly employed at the present day.

The process is the following, viz.:

Two gr. of the sample are placed in a porcelain dish with 5–10 c.c. H_2O and an excess of K_2CO_3 and boiled for 20–25 minutes, stirring constantly and replacing the evaporated water from time to time. The contents of the dish are then diluted with water to measure 100 c.c. and filtered. 50 c.c. of the filtrate, representing 1 grm. of the original sample, are then concentrated as far as possible without, however, evaporating to dryness. Glacial acetic acid in excess (2–3 c.c.m.) is stirred in, after which 50 c.c.m. absolute alcohol are added, and the vessel set aside for some hours. The precipitate obtained is brought upon a dry filter and washed out with absolute alcohol, and finally titrated with a half-normal caustic soda solution. Each c.c.m.of the alkali indicates 0.075 grm. tartaric acid.

The writer considers the method of Weigert a simplification of the process just described and communicates a series of systematic analyses made for the purpose of comparing the two. The most important result of this investigation is the discovery that absolute alcohol can be quite as well replaced by the ordinary 90 % alcohol, and without impairing the accuracy of the method. (*Chem. Zeit.*, *9, 247.*) H. M. R.

Remarks Concerning the English and Scotch Tar Xylols.
I. LEVINSTEIN.

It has been supposed that the English tar xylols contained no orthoxylol. This the author finds, however, not to be true, as all the xylols examined by him, in the course of a year, contained orthoxylol. In order to determine this, the following method was adopted :

100 c. c. of xylols are placed in a flask, mixed with 40 c. c. HNO_3 (1.40 Sp. Gr.) and 60 c. c. water, and heated to boiling with constant shaking for from thirty minutes to an hour. When no more red fumes are evolved, it is a sign that all the ortho- and paraxylols have been decomposed. The acid is now decanted through a separating funnel, the hydrocarbon washed with NaOH, and then distilled with steam. The distillate consists of metaxylols and

hydrocarbons of the fat series. It is measured and then shaken up
for half an hour with 1½ parts concentrated H_2SO_4, which converts
the metaxylol into its sulpho- acid. What remains undissolved are
hydrocarbons of the fat series.

Estimation of Paraxylols.

100 c. c. of xylols are shaken up for half an hour with 120 c. c.
strong sulphuric acid. This converts the ortho- and metaxylols into
sulpho- acids. The sulphuric acid is now separated by decantation,
and the remaining paraxylols and the hydrocarbons of the fatty
series are measured, and then treated with an equal volume of fum-
ing H_2SO_4 (containing 20% anhydride). This dissolves the para-
xylol and leaves the fatty compounds behind. The difference be-
tween the figures so obtained, and those obtained from the first 100
c. c. of xylols, gixes the amount of paraxylol present. If the sum
of the meta- and paraxylol be subtracted from the 100 c. c. of crude
xylol, the amount of orthoxylol will be found. (*Ber. d. chem.
Ges., 1884*, 444.)   J. H. S., Jr.

Certain Titrations with Potassium Permanganate. W. Lenz.

Several series of experiments were made to test the accuracy of
potassium permanganate as a means of determining the oxidizable
matter in drinking water. In the case of acid solutions (Ku-
bel's method), 100 c.c. water (with organic substance) were
mixed with 5 c.c. sulphuric acid and then with the measured
amount of permanganate. This was heated to gentle boiling for
just ten minutes and then titrated back with oxalic acid. With the
same amounts of grape-sugar and varying proportions of perman-
ganate, up to five times the necessary quantity, the amount used in
oxidation was considerably less than the theoretical. Even when
an insufficient quantity of permanganate was used the solution
remained red. When the permanganate remained the same and
the grape-sugar varied the permanganate did not afford even a
relative determination of the organic substance. When glycerine
was substituted for grape-sugar the oxidizing action of the per-
manganate was even less. The author concludes that under these
conditions the permanganate process is not applicable for an abso-
lute nor a relative determination of organic matter. The method

of Lalieu for glycerine determination—24 hours maceration of about
.5 grm. of substance with a strong alkaline permanganate solution
and titration with oxalic acid—gives fair, approximate results. The
oxalic acid solutions were always freshly prepared—dilute solu-
tions of oxalic acid can lose 15 per cent. in a week if exposed to dif-
fuse light. Normal solutions in closed flasks keep well in the dark.
The addition of boracic acid adds greatly to the keeping power.
A deci-normal oxalic acid with 1 per cent. boracic acid did not
change in seven months. The boracic acid is without influence
upon the determinations of oxidizable matter. (*Zeit. f. anal. Chem.*,
24, 34.) F. P. V.

Volumetric Estimation of Manganese by Permanganate.
C. MEINEKE.

The method of Volhard (titration with $KMnO_4$ in presence of
ZnO) is inaccurate, because the precipitate contains MnO ; it is
also unstable in presence of weak acids or excess of permanganate,
and the exact neutralization of the solution by ZnO, an excess of
which is prejudicial, is almost impossible, when the substance con-
tains iron. The author has improved this method by adding the
manganous solution at once to a standard solution of permanganate of
known volume, but in considerable excess of the quantity required.
The excess is then titrated back, with standard solution of antimo-
nious chloride. The precipitate of MnO_2 thus obtained is permanent
and free from MnO. A moderate excess of ZnO does not impair
the accuracy of the process. A number of results are given, showing
concordance of volumetric and gravimetric analyses in pyrolusite,
manganiferous iron ore, spiegel, &c. For standardizing perman-
ganate the author prefers crystallized oxalic acid. Anhydrous
(sublimed) oxalic acid, which has been recently recommended, has
the disadvantage of being very hygroscopic, and does not entirely
lose water, which it has once absorbed, even at 100°. (*Repert. anal.
Chem.*, 5, *1*.) A. A. B.

Estimation of N in Nitrates and Nitro- Compounds. C.
ARNOLD.

The substance is burned in a combustion tube, with a mixture of
equal parts of sodium formiate and hyposulphite (anhydrous) and
soda lime. The mixture containing the substance occupies 10 cm.

in the tube and is followed by 5 cm. of mixture, and 10 cm. of
soda lime. Strychnine nitrate yielded N, 10.51–10.55% ; theory
10.60%. Potassium nitrate, N 13.7 ; theory 13.86. (*Repert. anal.
Chem.*, 5, 42.)   A. A. B.

A Modification of Schiff's Apparatus for the Volumetric Determination of Nitrogen. L. GALTERMANN.

A source of error in Schiff's apparatus amounting to several
tenths of one per cent., lies in our inaccurate knowledge of the ten-
sion of the potash solution, varying at each determination. This is
avoided by using a non-calibrated collecting tube and transferring
the nitrogen through a narrow connecting tube into a measuring
tube filled with distilled water. The results thus obtained differ-
by a few hundredths only from the theoretical. (*Zeit. f. anal.
Chem.*, 24, 57.)   F. P. V.

Analytical Operations and Apparatus. R. WOLLNY.

The author describes first a piece of apparatus which he uses to
avoid the transference of a precipitate to the filter, and consequent
danger of loss. Also an extracting apparatus which combines diges-
tion with the vapor of the solvent together with an intermittent
washing with the condensed fluid. After extraction the solvent
can be directly distilled off. The apparatus is capable of many
modifications according to the nature of the substance to be ex-
tracted. For the descriptions and diagrams the original article
must be referred to. (*Zeit. f. anal. Chem.*, 24, 47.)   F. P. V.

A Thermoregulator of Simple Construction, which can also be Used as a Registering Thermometer. E. H. von BAUMHAUER.

Not intelligible without the accompanying diagrams. (*Zeit. f.
anal. Chem.*, 24, 421.)   F. P. V.

INDUSTRIAL CHEMISTRY.

Composition of Maple Sugar and Syrup. H. W. WILEY.

The fresh sap of the sugar maple tree (*Acer Saccharinum*), has

been shown by the author in a previous paper (Proc. A.A.A.S., 28) to contain 2.82% of sucrose as an average of 28 analyses. All of the sugar exists as sucrose, no trace of any reducing sugar being present. The proportion of invert sugar in commercial (pure) maple sugar is very low, although the sap is always evaporated in open pans. In pure aqueous solution, therefore, it is evident that heat alone does not invert sucrose as rapidly as if organic impurities and mineral salts are present.* The commercial sugars and syrups are found to be largely adulterated, the former with cane or beet sugar, the latter with starch sugar or glucose. There is no known method of detecting the adulteration of maple sugar with cane or beet sugar, since it is chemically identical with them, and the mixture retains the characteristic taste of maple sugar. Maple sugar, however, is sold at double the price of cane sugar. A patent has been recently taken out in the United States for an extract of hickory bark which is used to impart the maple flavor to syrups and sugars. (*Chem. News*, **51**, 88.)   A. A. B.

The Viscosity of Lubricating Oils. C. ENGLER.

The author calls attention to the defects and inaccuracies in the testing of lubricating oils by present methods. He describes an apparatus of his own invention by which these defects are in great measure overcome. The article is scarcely intelligible without the accompanying diagram. (*Chem. Zeit.*, *9, 189.*)   H. M. R.

On the rate of Propagation of Detonation in Solid and Liquid Explosives. M. BERTHELOT.

	METRES PER SECOND.
Compressed, disintegrated gun Cotton	3,903 to 4,267
Granulated gun Cotton	3,767 to 4,770
Starch Powder	5,210 to 5,512
Nitromannite	6,908 to 7,137
Nitroglycerine	1,386 to 1,672
Dynamite	2,333 to 2,753
Panclastite	4,685 to 5,470

(*Comptes Rend.*, **100**, 314.)   C. E. M.

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* A residue known as "sand" accumulates in the evaporating pans, however. It is principally calcium malate.—B.

Abstract of American Patents Relating to Chemistry.

(*From the Official Gazette of the U. S. Patent Office.*)

February 24th, 1885.

312,605.—Eliminating the smell of coal oil.—L. Blumenthal.

312,632.—Furnace for manufacturing iron and steel.—J. Henderson.

312,641.—Manufacture of iron.—J. J. Johnston.
The pig iron is melted and conveyed to a heated receiving chamber, in which it is thoroughly mixed with a mixture of iron ore, lime and salt, after which it is transferred to a boiling furnace.

312,644.—Vacuum pump.—A. Kux.

312,674.—Process of treating oleaginous seeds for the extraction of oil.—A. E. Thornton.

312,727.—Cupola furnace.—J. J. Johnston.

312,728.—Composition of matter for the manufacture of gas.—J. J. John ston.
Consists of a mixture of pulverized, and desulphurized coal, water and oil.

312,729.—Apparatus for manufacturing gas.—J. J. Johnston.
Coal, or suitable composition of matter, is placed in a vessel within a larger closed chamber, exposed to the heat of the furnace and distilled. In order to dilute the rich gas from the coal or composition, oil and water are supplied in drops to the inner retort on the surface of the coal or composition, and the gas evolved therefrom is mingled with the gas from such coal or composition.

312,730.—Method of manufacturing gas.—J. J. Johnston.
Bituminous coal is pulverized, and the sulphur is mechanically separated. Oleaginous matter and water is then added to the coal, and the mixture is dis° tilled by conducted heat, and the resulting gas is fixed by direct contact with the heat conducting medium.

312,735.—Filtering device.—W. E. Lindsay.

312,759.—Furnace for reducing zinc and other metals.—J. Quaglio.

312,774.—Carburetor.—E. J. Vaughan.

312,777.—Means for carrying off leakage from gas mains.—G. Westing-house, Jr.

312,784.—Mixed paint.—J. B. Wood.
Consists of creosote or dead oil, coal tar, spirits of turpentine, and plum. bago.

312,811.—System of conveying and distributing gas.—A. W. Cadman.

312,814.—Apparatus for treating metals by means of electrolysis.—H. R. Cassell.

312,836.—Carburetor. E. J. Frost.

312,847.—Process of extracting silver, gold and lead from ores.—W. E. Harris.

The process consists in mixing finely pulverized oxide of iron or copper with the gold, silver or lead ores, and then smelting the mixture on a bath of lead.

812,869.—Method of preparing extracts from cereals.—H. Lehrenkrauss.

The grain is soaked to soften the bran coating, and the latter is removed and boiled to extract the nutritious portion. The mixture is then strained and glutinous extract evaporated.

812,894.—Manufacture of alumina by paper mill sludge.—C. V. Petraeus.

Alumina free from iron is made from ferruginous material, by mixing it with the spent soda liquor from the manufacture of wood or straw paper pulp, and evaporating and burning the mixture.

812,904.—Process of treating phosphatic slag.—C. Scheibler.

The process consists in slowly cooling the slag, when a transposition in the constituents of the slag takes place, the phosphoric acid being concentrated in one part, and the iron and manganese in another.

812,945.—Manufacture of parchment paper or leatheroid.—E. Andrews.

812,948.—Apparatus for rectifying spirits and spirituous liquors by electricity.—T. E. Atkinson.

812,954.—Process of preventing tarnishing in silverware.—F. J. Blain.

The silver is wrapped in fibrous material impregnated with a solution of the acetates of lead.

812,995.—Process of preserving meats.—G. Holgate.

The meat is treated with sulphurous anhydride and carbonic acid gas.

March 3, 1885.

313,045.—Compressor for ice making apparatus.—A. T. Ballantine.

813,047.—Method of cooling coils of gas condensers.—V. H. Becker.

Consists in introducing air into the fluid surrounding the coils or pipes.

813,049.—Ventilating measure funnel.—L. Bolus and P. Ellsperman.

813,064.—Apparatus for dipping matches.—E. B. Eddy, G. H. Millen and E. Mousseau.

813,070.—Apparatus for washing.—J. T. Gent.

813,071.—Smoke-consuming furnace.—F. B. Giesler.

813,076.—Case for preserving food.—J. J. Hoyt.

813,077.—Apparatus for emptying barrels or other receptacles containing liquids.—B. F. Hudson.

The apparatus consists of a bung, provided with a delivery tube, and air injecting apparatus.

813,079.—Manufacturing iron and steel.—B. Bayliss, Jr.

813,086.—Artificial Fuel.—G. Leder.

Consists of a mixture of resin and cotton seed hulls.

813,101.—Hydrocarbon furnace.—O. D. Orvis.

313,102.—Lining for the grooves of pipes, welding furnaces.—E. Peck-ham.

Consists of Search or unglazed white or C C ware, or its equivalent, viz : burned compound of feldspar, kaolin and china clay

313,106.—Producing transfers of drawings, engravings, &c.—J. Ramsdell.

313,107.—Process of treating paper to preserve it against the corrosive action of acids.—J. Ramsdell.

The paper is treated with glycerine.

313,118.—Red colouring matter.—J. H. Stebbins, Jr.

A red colouring matter denominated " benzidan-sulphonate of soda-diazo-diethylaniline.

313,152.—Food for infants and invalids.—W. R. Barker and A. L. Savory

Flour or meal is mixed with fresh milk and cooked and dried at a tem-perature not below 230° F. The mass is then reduced to powder and mixed with powdered malt.

313,162.—Pharmaceutical still.—J. Berry

313,164.—Amalgamating pan.—J. A. Burvell.

313,174.—Filtering paper.—E. W. Carter and D. L. Smith.

The sheet of filtering paper is thicker at and near the centre than near the circumference.

313,172.—Manufacture of tanning extract.—T. F. Chin.

The process consists in passing chrome acid and sulphurous acid gases and steam through the bark liquor obtained in a tan run tub.

313,208.—Machinery for manufacturing Portland cement.—J. Stubbins

313,209.—Brick extracting apparatus.—L. Gormar

313,211.—Manufacture of Portland cement.—S. V. Lesser

Consists in incorporating with the cement materials a small oil black ......

313,236.—Apparatus for ageing and preserving distillers and fermented liquors.—J. V. Inman

313,237.—Apparatus for treating fermented liquors ... distilled liquors.—J. V. Inman

313,242.—Air pump.—A. L. Jerome

313,304.—Apparatus for heating and ... gas.—F. Fuller

313,307.—Gas annealing furnace.—J. ... Gray

313,308.—Regenerative furnace.—S. ... Gray

313,308.—.... of acid, ...—J. ... Terrer

... in the ... sodium ... and ... water

313,400.—Apparatus for ... .—E. Hyatt

313,402.—Furnace for ... .—... Hull.

313,412.—Varnish.—... .—... ...

Consists of ... and German ... ... grease and oil, wax

313,430.—Petroleum ... .—... S. Kind.

313,431.—Process of separating ... from ... —... Lent

313,432.—Machine for making ... .—J. S. T...

313,440.—Process of extracting oil from formed oil cake.—J. L. Moss and M. Littell.

The oil cakes are pressed between highly polished plates.

March 10, 1885.

313,468.—Weighing scales.—C. Becker.

313,478.—Apparatus for tanning hides.—J. Davis.

313,501.—Fire-proof building material.—J. C. Kerner.

Consists of sawdust treated with hyposulphite of soda and alum, held together by plaster of paris or lime.

313,508.—Gas burner.—O. D. McClellan.

313,510.—Machine for reducing bagasse to pulp to extract the saccharine matter.—S. C. Meyer.

313,514.—Apparatus for removing paraffine from oil tanks.—J. W. Norton and F. H. Rouse.

313,522.—Hardening and coloring serpentine rock.—J. J. Pratt.

Blocks of the material are exposed to a gradually increasing temperature of from 100° to 1,000°, while protected from cold air, and then gradually cooled.

313,537.—Blast furnace.—D. Sandstrom and J. H. Anderson.

313,542.—Apparatus for tanning.—L. Simpson.

313,543.—Apparatus for tanning.—L. Simpson.

313,575.—Device for generating and burning gases.—R. A. Bury and R. M. Bidelman.

313,629.—Manufacture of cream of tartar.—R. Silverberg.

The process consists in separating the tartaric acid from argols by any approved method, and then treating the mother liquors obtained with soda and potassium chlorate.

313,665.—Process of extracting the oil and albuminoid matter from corn.— F. V. Greene.

The oil and albuminoid matter are separated from the corn in the form of an emulsion, which is freed wholly or partly from water, after which they are separated.

313,693.—Apparatus for cleaning oils.—J. C. Thornton.

313,700.—Process of coating metal.—W. J. Wilder.

Consists in applying a blast of cold air to the reverse side while the hot tin is being applied to the first side.

313,716.—Welding compound.—C. C. Fields.

Consists of sulphate of baryta, prussiate of potash and sal ammoniac.

313,736.—Apparatus for preserving by gases.—G. Holgate.

313,748.—Apparatus for treating ores with superheated steam.—J. H. Mathews.

813,102.—Lining for the grooves of pipes, welding furnaces.—E. Peckham.

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813,118.—Red coloring matter.—J. H. Stebbins, Jr.

A red coloring matter denominated " benzolazo-sulphonate of soda-diazo-diethylaniline.

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Flour or meal is mixed with fresh milk and cooked and dried at a temperature not below 220° F. The mass is then reduced to powder and mixed with powdered malt.

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813,164.—Amalgamating pan.—J. A. Bidwell.

813,174.—Filtering paper.—E. W. Carter and D. R. Smith.

The sheet of filtering paper is thicker at, and near its center than near the circumference.

813,177.—Manufacture of tanning extract.—T. F. Colin.

The process consists in passing carbonic acid and sulphurous acid gases and steam through the bark liquor contained in a vacuum pan.

813,208.—Machinery for manufacturing Portland cement.—D. Griffiths.

813,208.—Metal extracting apparatus.—J. L. Hornig.

813,217.—Manufacture of Portland cement.—R. W. Lesley.

Consists in incorporating with the cement material, after calcination, black chalk.

813,236.—Apparatus for ageing and preserving distilled and fermented liquids.—C. W. Ramsay.

813,237.—Apparatus for treating fermented, fermentable, or distilled liquids.—C. W. Ramsay.

813,243.—Air pump.—A. L. Robbins.

813,306.—Apparatus for bleaching and dyeing.—J. Farmer.

813,347.—Glass annealing furnace.—G. Leufgen.

813,348.—Regenerative furnace.—G. Leufgen.

813,869.—Solution of acid phosphate.—C. V. Petraens.

Consists of dihydrogen sodium phosphate, phosphoric acid and water.

813,401.—Apparatus for drying fertilizers.—H. Breer.

813,403.—Furnace for burning liquid hydrocarbons.—J. Buffet.

813,412.—Waterproof compound.—J. T. Elliot.

Consists of coal tar, Portland cement, calcined gypsum, iron ore, ground slate and resin.

813,430.—Beer-mash tub.—L. S. Kuhn.

313,431.—Process of preparing grain for mashing.—L. S. Kuhn.

313,432.—Machinery for cooking mashes.—L. S. Kuhn.

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The oil cakes are pressed between highly polished plates.

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Consists of sulphate of baryta, prussiate of potash and sal ammoniac.

813,736.—Apparatus for preserving by gases.—G. Holgate.

813,748.—Apparatus for treating ores with superheated steam.—J. H. Mathews.

818,751.—Machine for cleaning and washing bones.—C. Meyer, Jr.

818,754.—Regenerative furnace.—T. T. Morrell.

818,755.—Chemical fire engine.—W. Morrison.

818,779.—Gas lamp.—F. Siemens.

818,795.—Gas fluid.—A. F. Timmerling.
A gas fluid compound of fusel oil, carbon oil (consisting of petroleum distillate at a gravity of about 74° B.) and wood naphtha.

818,828.—Composition for curing paving blocks or bricks.—T. A. Huguenin.
Consists of coal tar, bitumen, pine gum and alum.

818,834.—Gas burner.—W. M. Noel.   W. R.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING held April 3d, 1885.

Mr. J. H. Stebbins in the chair.

Minutes of last meeting read and approved.

The resignations of Dr. Nicholas Gerber, Thun, Switzerland ; Dr. F. G. Wiechman, New York; and associate William Ziegler, New York, were read and accepted.

The following papers were then read :

Cider and Vinegar, by W. French Smith, Ph. D.

Analysis of the Leaves of the Ilex Cassine, by F. P. Venable, Ph. D.

A new Filtering Apparatus, by P. Casamajor; read by title and ordered to be printed.

Estimation of Nitrogen in Organic Aromatic Compounds by the Kjeldahl Method, by J. H. Stebbins, Jr.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

Additions to the Library.

BOOKS PRESENTED BY THE AUTHORS.

M. BERTHELOT.—Les Origines de l'Alchemie.

E. R. SQUIBB.—An Ephemeris of Materia Medica, Pharmacy, Therapeutics and Collateral Information. Vol. I and Vol. II, Nos. 1–8.

W. SIMON.—Manual of Chemistry.

REPORTS.

Connecticut Agricultural Experiment Station.—Annual Report for 1884.

The American Museum of Natural History.—Annual Report of the Trustees for 1884–85.

ANALYSIS OF THE LEAVES OF ILEX CASSINE.

BY F. P. VENABLE, PH. D.

The Yopon (*Ilex Cassine*, Linn), is described in Hale's "Woods
and Timbers of North Carolina," as an elegant shrub 10 to 15 feet
high, but sometimes rising into a small tree 20 to 25 feet. It has,
according to the same authority, for its *habitat* the strip of country
from Virginia southward along the coast, never extending, how-
ever, very far into the interior. The leaves are ½ to 1 inch long,
with a smooth surface, and fine serrated edge. The plant is an
evergreen, and its dark green leaves and bright red berries make it
attractive as an ornamental shrub. In the region of the Dismal
Swamp, and in other sections the leaves are annually gathered, dried,
and used for tea. This decoction is, according to Hale, oppressively
sudorific, at least to those unaccustomed to its use. The famous
"Black Drink" of the southern Indians was made from the leaves of
this shrub. "At a certain time of the year they come down in
droves from a distance of some hundred miles, to the coast for the
leaves of this tree. They make a fire on the ground and putting a
great kettle of water on it, they throw in a large quantity of these
leaves, and seating themselves around the fire, from a bowl that
holds about a pint, they begin drinking large draughts, which in a
short time occasions them to vomit freely and easily. Thus they
continue for the space of two or three days, until they have suffic-
iently cleansed themselves, and then every one taking a bundle of
the leaves, they all retire to their habitations." Having on hand a
small sample of these leaves procured from New Berne during the
Winter of 1883, it seemed desirable to make an examination of
them to decide, if possible, the presence of any alkaloid or other
principle which would make the decoction useful as a beverage.
The usual treatment with magnesium oxide, exhaustion with water,
separation by means of chloroform and subsequent purification, was
adhered to, resulting in obtaining a small amount of a white sub-
stance slightly soluble in water, more so in alcohol, and easily
soluble in chloroform, which gave distinctly the tests for caffeine,
especially the murexide reaction, and very closely resembled a speci-
men of pure caffeine from Powers & Weightman.

This caffeine formed .32% of the dried leaves. Later on, in May,
a much larger supply of the same leaves was gotten from the

neighborhood of Wilmington. A more thorough examination of them was then made with the following results:

Water in air-dried sample............13.19
Extracted by water...................26.55
Tannin......... .... 7.39
Caffeine............. .... .27
Nitrogen (on combustion). .... .73
Ash..... .... 5.75

The analysis of the ash is shown in column I.

	I.	II.
CaO	10.99	12.34
MgO	16.59	11.39
Na_2O	.47	7.28
K_2O	27.02	2.98
MnO_2	1.73	2.50
Fe_2O_3	.26	3.41
SO_3	2.50	.92
Cl	.66	.71
P_2O_5	3.34	5.54
SiO_2	1.32	44.75

The Maté or Brazilian Holly (*Ilex Paraguayensis*), belongs to the same genus. Its ash analysis, as made by Senor Arate, is given in column II. The plant grows wild in Brazil and is very largely used by the South Americans. It has, according to Peckolt (Pharm. J. Trans. [3] 14, 121–124. Abstract, Jour. Chem. Soc., 1884, 479), been planted, and seems to succeed well, in the Cape of Good Hope, Spain and Portugal. It is stated that six different species of Ilex are used in the preparation of this tea. Peckolt gives, in his analysis of the air-dried leaves, the percentage of caffeine as .639. The average percentage of analyses, by different authors, is about 1.3. I can find mention of only one other Ilex used as a substitute for tea. The analysis of this by Ryland and Brown is quoted in Blythe's " Composition and Analysis of Foods," p. 343. It is called the Ilex Cassiva, is said to be used as a tea in Virginia, and the percentage of caffeine is given as .12. This is probably the same thing as the Yopon, the analysis of which is give above, and the " cassiva " may be a misprint for " cassine."

UNIVERSITY OF NORTH CAROLINA.

CIDER AND VINEGAR.

By W. French Smith, Ph. D.

This investigation was commenced in September, 1882, to ascertain the maximum and minimum percentages of alcohol and acetic acid which genuine apple-juice would produce.

In each case the apples were selected, and the juice expressed under my own supervision, and the cider was allowed to ferment slowly for two months in a cellar, at an average temperature of 14°C. At the expiration of this time the alcohol was determined by the ordinary method of distillation and specific gravity. Duplicate estimations were made with each sample.

The ciders numbered I. to VI., inclusive, were of agreeable flavor and aroma, but VII. and VIII. were barely palatable.

Cider No. I., prepared from selected apples of the variety generally known as "August Sweets," gave 9.40 per cent. alcohol.

Cider No. II., from average "August Sweets," gave 6.05 per cent. *

Cider No. III., from "August Sweets" not thoroughly ripened, gave 4.80 per cent.

Cider No. IV., from selected "Porter" apples, gave 4.85 per cent.

Cider No. V., from "Porter," only partially ripened, gave 4.05 per cent.

Cider No. VI., from "Greening" apples picked from the trees, gave 4.00 per cent.

Cider No. VII., from "Greening" apples taken from the ground, gave 3.85 per cent.

Cider No. VIII., from poorest "Greening" apples taken from the ground, gave 3.00 per cent. alcohol.

The average of these determinations is five per cent.*

These results indicate that a good cider should contain about five per cent. and a fair sample ought not to fall below four per cent. of alcohol, and if it is less than 3.5 per cent. the cider must have been diluted, or prepared from extremely bad apples, for in number VIII. I endeavored to select a fruit which would produce a cider of the lowest possible alcoholic strength. In my opinion cider made from such apples is unsuitable for use.

---

* These percentages are *by weight.*

In the autumn of 1883 I determined the acidity and solid residue in the first six of these samples. Nos. VII. and VIII. could not be protected from putrefactive decomposition, during the summer of 1883.

The acid was estimated by titration with standard sodium hydrate, and the residue by evaporation, and drying at 100°C.

Vinegar No.	Per cent. of acetic acid.	Per cent. of solid residue.
1.	10.10	3.64
II.	6.80	3.35
III.	5.65	3.10
IV.	5.70	3.20
V.	4.40	2.70
VI.	4.45	3.22
Average.	6.18	3.20

The actual amounts of acetic acid found are lower than the alcoholic percentages in the original ciders demand, but this can be explained by imperfect acetification. I find manufacturers pretty generally agree that perfect conversion, by the cellar process, requires from two and a half to three years. I regret that I was unable to examine these samples again later, owing to an accident.

The percentages of alcohol found in the original ciders would require the following acidities, if the oxidation had been complete, viz.:—I., 12.22 per cent.; II., 7.86 per cent.; III., 6.24 per cent., IV., 6.30 per cent.; V., 5.26 per cent.; VI., 5.20 per cent.

Theoretically, one part of alcohol should yield about one and one-third parts of acetic acid ; practically, the manufacturers realize about one part acid for each part of alcohol. Calculating upon this basis, the averages of the vinegars produced by the first six ciders would be 5.53 per cent. acid.

While a genuine cider vinegar may contain less than 4 per cent. acetic acid, it is evident that a good article should consist of about 5 per cent., and vinegar prepared from the better grades of cider will represent from 5.5 to 7 per cent. acidity.

I believe that apples must be *carefully selected* to yield a vinegar above 7 or 8 per cent.

It is noticeable that samples V. and VI. could be preserved,

while putrefactive decomposition could not be arrested in Nos. VII. and VIII. In one case the difference in alcoholic strength is only 0.15 per cent.

The lowest solid residue is 1.2 per cent. higher than the figure defined in the Massachusetts Statutes as the minimum for a merchantable vinegar, *i. e.* 1.5 per cent., while the average is more than double this standard.

BOSTON, March 1, 1885.

TWO NEW FILTERS AND A NEW ASPIRATOR.

BY P. CASAMAJOR.

I propose to describe two new filters which I have lately used with advantage, and also an apparatus for starting an aspirator. This apparatus may be applied to one of the new filters described or to others working in a similar manner.

Fig 1
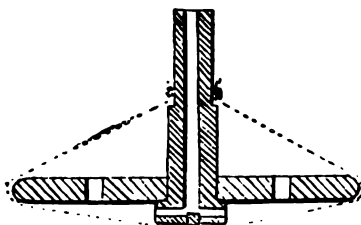
One form of filtering apparatus is shown in section in Fig. 1. The vertical portion is a tube open at the top. The horizontal portion is a circular disc, provided with a few holes to establish communication between the upper and lower surfaces of the disc. Below the disc, horizontal openings are made to allow the vertical tube to communicate with the space below the disc. The vertical tube may have the same diameter throughout, but the walls of the tube are thicker in the lower portion than in the middle, and in this thicker than in the upper. The tube does not taper uniformly on the outside, but there is a shoulder between each portion and the one above it, the lower shoulder being designed to hold the disc in its place.

The filtering medium used with this apparatus is a circular piece of cloth, the center of which is placed under the vertical tube. The cloth is folded over the edge of the disc, so that the edges of the cloth meet above the shoulder between the middle and upper portion of the tube. These edges are fastened above this shoulder by

means of a string or a wire. The upper portion of the vertical tube may then be connected with a rubber tube.

To use this apparatus, it may be placed in a vessel containing the liquid to be filtered. The rubber tube attached to the vertical tube may pass over the edge of the tank and be prolonged downwards on the outside below the position of the filter in the liquid. The syphon formed in this way may be started by suction. The liquid to be filtered passes through the cloth and outwards through the rubber tube.

Wood is the most convenient material for making this filter. It has the drawback that it floats, which may be remedied by attaching a weight to the portion shown in Fig. 1.

For certain purposes this portion may be made of metal—iron, lead, tin, etc. Instead of pure lead, an alloy of lead 90 parts, antimony 10 parts, tin 5 parts, will be found to be harder and sufficiently tough.

This filtering apparatus is applicable to manufacturing operations on a small scale rather than to laboratory work.

The second form of filter is one which I have had in use for some time. I have named it the *sand poultice*. It is a bag full of sand, *through* which the liquid to be filtered has to pass. The bag holding the sand is made of two circular pieces of cloth, whose edges are sewn to a strip of cloth about 1½ inches wide. After this bag has been filled with sand, it has the shape of a flat circular box.

When in use, this sand poultice must lie on a perforated surface in a cylinder. The poultice is made of such a size that, when pressed down on the perforated surface, the vertical edge, formed by the strip of cloth, presses tightly against the cylindrical surface. It is to obtain this tight fit that the strip of cloth is used, and that the bag has not been made by sewing together the edges of the two circular pieces of cloth.

When this filter was first used, it was found impossible to dislodge a certain amount of air which inflated the upper covering of the sand poultice. This was afterwards avoided by making a slit in this portion of the cloth through which the air escaped. A certain portion of dirt is in consequence deposited on the sand instead of on the cloth; but this has not been found practically objectionable.

Under the perforated plate supporting the sand poultice is a

space for the collection of filtered liquid, which may very con
veniently be let out by a faucet. With the sand may be mixed
powdered charcoal, bone black, etc. The sand poultice may be
taken out and washed as often as is desirable, and the bag may be
refilled when necessary.

During the late period of turbidity in the Brooklyn water supply
I have had occasion to use the sand poultice for filtering water for
domestic use. I have found it advantageous to have a layer of fine
gravel on top of the poultice, to arrest the greatest part of the muddy
deposit and prevent it from obstructing the cloth. This gravel was
taken out and washed twice a week without disturbing the rest of
the filter. After being washed, the gravel was put back on top of
the bag. After doing this five times, it was found necessary to
take out the poultice itself to wash the cloth covering.

APPARATUS FOR STARTING A SYPHON.

This apparatus was suggested by a very ingenious arrangement
used in Dr. E. R. Squibb's acetic acid works. I have his permission
for describing it here. In these works the acid is stored in very
large stoneware receivers, which have no opening at the bottom,
but they are provided with two tubulures on top. Through these
tubulures pass glass tubes which go to the bottom of the receivers.
Every tube is connected with a similar one on the receiver next to
it by means of a bent connecting tube. These 3 tubes, held to-
gether by means of rubber tubes, form an inverted V. On top of
the bent tube is a tubulure over which passes a rubber tube, which
is closed or opened by means of a pinch cock. Through this tubu-
lure the inverted V is filled by pouring in acid, after which the
pinch cock is closed. The last tube of a train connects in a similar
manner with a vertical glass tube which extends to the story below.
This vertical tube ends, on its upper portion, in a T, one branch of
which connects with the tube in the last receiver of the train. The
upper end of the T has a rubber tube over it, which is closed with
a pinch cock. When it is desired to draw acid from the train of
receivers, this pinch cock is opened and acid is poured in a funnel
above the pinch cock. The vertical tube is filled, the pinch cock closed
and the acid, in running down, forms a syphon, by which the re-
ceivers are emptied, either wholly or in part, as may be desired.
When sufficient acid has run out the pinch cock over the long
vertical tube is opened, air is admitted and the flow ceases.

The apparatus shown in Fig 2 is made by connecting a thistle

Fig 2

tube to a tube B by means of a rubber pipe closed by a pinch cock. The lower end of tube B is placed above a reduced portion of tube C. When water runs down from the thistle tube by opening the pinch cock, an aspiration is produced in tube C. The horizontal branch of the T tube C connects with a filtering apparatus, which may be the one represented in Fig. 1. It is also applicable to Dr. Carmichael's filter, or to the filter described by me in the *Journal of the American Chemical Society*, Vol. III, p. 125, in which the vertical tube causing aspiration is filled by suction from a flask, but the apparatus shown in Fig. 2 is much more convenient.

After filling the thistle tube with distilled water the pinch cock is opened, and the water rushing downwards from tube B produces a vacuum in tube C connecting with a filter. This soon becomes filled with filtered liquid.   In the apparatus in use in my laboratory 3 or 4 cubic centimeters of water are sufficient to start the action by filling the vertical tube below tube C.

This apparatus differs from the one used in Dr. Squibb's works, by the use of the tube B and the narrowing of the tube C below the end of tube B. This addition was found necessary because when the tube B is not used the opening of the pinch cock below the thistle tube causes a momentary increase of pressure in the tube C until the vertical tube below C has been filled. This disarranges the asbestos on the platinum plate in the filter described in the *Journal of the American Chemical Society*, Vol. III, p. 125, and the operator is put to much trouble.

ON THE ESTIMATION OF NITROGEN IN COMPOUNDS OF THE AUROMATIC SERIES BY THE KJELDAHL METHOD.

By James H. Stebbins, Jr.

Since the publication of Kjeldahl's method for the estimation of nitrogen I have made quite a number of analyses of fertilizers in which the nitrogen was estimated according to this process, and always with good results. At first, however, I was rather doubtful of their accuracy, and therefore made a few parallel tests by combustion with soda lime. These soon showed that the method might be relied upon, except in fertilizers containing a large amount of nitrates. The results obtained were invariably a little higher than those obtained by combustion, but entirely within the range of error. Having obtained such fair results with fertilizers, I was anxious to ascertain whether it might be used to advantage in the analysis of aromatic nitrogen compounds, and thus do away with the troublesome operation of estimating the nitrogen by combustion with oxide of copper.

To what extent this process may be relied upon will be seen from the following data :

Paratoluidine.

$$1 : 4 \ C_6H_4(CH_3)NH_2$$
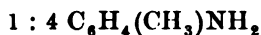
0.50 grm. perfectly dry paratoluidine, was dissolved in 20 c. c. of sulphuric acid mixture (4 vols. sulphuric acid 66° B., 1 vol. fuming H_2SO_4 containing in each 20 c. c. of mixture 2 grms. P_2O_5), and heated to boiling until the whole mixture had become nearly colorless. Time required, 1h. 15 m. The mixture was then oxidized as usual with $KMnO_4$, neutralized with 140 c. c. of 16 per cent. soda

solution and distilled. The ammonia given off was collected in
50 c. c. $\frac{N}{10}$ H_2SO_4, the distillation lasting 30 minutes. The amount
of sulphuric acid not neutralized by the ammonia was estimated
with $\frac{N}{10}$ soda solution.   50 c. c. $\frac{N}{10}$ H_2SO_4 required for neutraliza-
tion 11.8 c. c. $\frac{N}{10}$ NaOH.   Therefore 38.2 c. c. of the acid had been
neutralized by the ammonia.

$$\therefore 38.2 \times .0014 = .05348 \ N.$$

Equivalent to nitrogen .... 10.69 per cent.
Theory .... 13.17   "

The great discrepancy between the two results led me to believe
that, perhaps, the amount of sulphuric acid mixture used had not
been sufficient for the complete decomposition of the paratoluidine.
The experiment was therefore repeated, using only 0.25 g. in lieu
of 0.50 g.   The other conditions were the same, with the exception
of a little sand added to the acid mixture to prevent bumping.

Substance taken .... 0.25 g.
Quartz sand............................... 0.50 "

This mixture was heated for two hours.   The solution, at the
end of this time, had become transparent and of the color of white
wine.   It was then oxidized with $KMnO_4$, and distilled after neu-
tralization with NaOH.

50 c. c. $\frac{N}{10}$ H_2SO_4 required for neutralization 29.7 c. c. $\frac{N}{10}$ NaOH.
Therefore $50 - 29.7 = 20.3 =$ the amount of acid neutralized by
the ammonia.

$$20.3 \times .0014 = .02842 \ N.$$

Equivalent to nitrogen .... 11.44 per cent.
Theory .... 13.17   "

As will be seen the result obtained this time is a trifle better,
but still wide of the mark.   I therefore thought that the discrep-
ancy in the amount of nitrogen obtained might be due to two
things, viz. : to the volatility of the paratoluidine, or to the tenac-
ity with which some aromatic compounds hold on to the nitrogen
they contain, thus preventing a complete conversion of the nitro-
gen into ammonium sulphate.   As, however, the paratoluidine

enters immediately into combination with the sulphuric acid, forming a sulphate which is a much more stable compound than the original substance, the first of these two reasons would hardly hold good, and must therefore be discarded.

In order to prove that the above theory is correct two other tests were made, using compounds the nature of which would lead one to expect similar results.

Diphenylamine.

$$C_6H_5\diagdown$$
$$N - H$$
$$C_6H_5\diagup$$
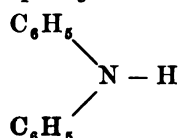
Substance taken.... .... 0.25 g.
Quartz sand................................... 0.50 "

Heated the above with 20 c. c. of sulphuric acid mixture for 2h. 30m., until the contents of the flask had assumed a white wine color. Then oxidized with $KMnO_4$, and distilled as usual.

50 c. c. $\frac{N}{10} H_2SO_4$ required for neutralization 36.1 c. c. $\frac{N}{10}$ NaOH.

50 — 36.1 = 13.9 c. c. = acid neutralized by the ammonia.

13.9 × .0014 = .01946 N.

Equivalent to nitrogen................ 7.78 per cent.
Theory...................................... 8.28   "

It will be observed in this example, that the nitrogen found is much closer to theory than in the other two cases. This is probably due to the fact that the nitrogen was more readily acted upon by the sulphuric acid, thus giving a greater yield of ammonium sulphate. In the following example, however, there is again a great error, because in this case the nitrogen is very firmly bound to the two benzole nuclei, and is not sufficiently acted upon by the sulphuric acid to be entirely converted into ammonium sulphate.

· *Azobenzole.*

$$C_6H_5 - N \quad N - C_6H_5$$

Substance taken........................... 0.25 g.
Sand.................... .... 0.50 "

Heated mixture for 3h. 30m. with 20 c. c. sulphuric acid, oxidized and distilled.

50 c. c. $\frac{N}{10}$ H$_2$SO$_4$ required for neutralization 25. c. c. $\frac{N}{10}$ NaOH.

$$25 \times .0014 = .0350 \text{ N.}$$

Equivalent to nitrogen _____ 14 per cent.
Theory _____ _____ _____ 15.38 "

Having obtained such poor results from compounds in which the nitrogen was firmly bound to the benzole nuclei, it seemed probable that in using substances in which the nitrogen might be more easily driven off better results might be obtained. For this purpose the nitro- compounds were chosen.

Dinitrobenzole (a).

$$C_6H_4(NO_2)_2$$
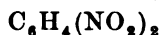
Substance taken _____ _____ ___ 0.25 g.
Quartz sand _____ 0.50 "

Heated the above to boiling with 20 c. c. of sulphuric acid mixture, oxidized with KMnO$_4$, and distilled as usual.

50 c. c. $\frac{N}{10}$ H$_2$SO$_4$ required for neutralization 36 c. c. $\frac{N}{10}$ NaOH.

50 — 36 = 14 c. c. = acid neutralized by the ammonia.

$$14 \times .0014 = .0196 \text{ N.}$$

Equivalent to nitrogen _____ 7.84 per cent.
Theory _____ _____ 16.66 "

This great discrepancy led to the conclusion that the small yield of nitrogen was simply due to the fact that a part of the nitrogen had been driven off by the sulphuric acid as NO. It was therefore suggested to me to mix with the sulphuric acid a substance, which, upon heating, would evolve a large volume of sulphuric acid, and thus act as a reducing agent upon the NO.

The substance best suited for this purpose is pure cane sugar. The results obtained in using this slight modification were quite satisfactory, and encouraged me to go on.

Dinitrobenzole (b).

$$C_6H_4(NO_2)_2$$
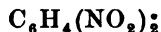
Substance taken _____ 0.25 g.
Sugar _____ _____⌐_ 0.50 "
Sand_____ _____ 0.50 "

Heated to boiling for 1h. 30m., oxidized with KMnO$_4$ and distilled.

50 c. c. $\frac{N}{10}$ H$_2$SO$_4$ required 21.2 c. c. $\frac{N}{10}$ NaOH.

50 — 21.2 = 28.8 = acid neutralized by the ammonia.

$$28.8 \times .0014 = .04032 \text{ N.}$$

Equivalent to nitrogen _____ 16.12 per cent.

Theory _____ 16.66   "

The amount of nitrogen found is a little low, still the error is not much larger than sometimes occurs in making a combustion with oxide of copper.

Metanitraniline.

1 : 3 C$_6$H$_4$(NO$_2$)NH$_2$
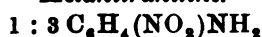
Substance taken _____ 0.25 g.

Sugar _____ 0.50 "

Sand _____ 0.50 "

Heated to boiling for two hours, with 20 c. c. of sulphuric acid mixture, and treated as usual.

50 c. c. $\frac{N}{10}$ H$_2$SO$_4$ required for neutralization 14.2 c. c. $\frac{N}{10}$ NaOH.

50 — 14.2 = 35.8 c. c. = acid neutralized.

$$35.8 \times .0014 = .05012 \text{ N.}$$

Equivalent to nitrogen _____ 20.04 per cent.

Theory _____ 20.29   "

Orthonitrophenole.

1 : 2C$_6$H$_4$(OH)NO$_2$
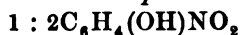
Substance taken _____ 2.25 g.

Sugar _____ 0.50 "

Sand _____ 0.50 "

Heated with 20 c. c. sulphuric acid mixture, etc.,

50 c. c. $\frac{N}{10}$ H$_2$SO$_4$ required for neutralization 32.6 c. c. $\frac{N}{10}$ NaOH.

50 — 32.6 = 17.4 c. c. = acid neutralized by the NH$_3$.

$$17.4 \times .0014 = .02436 \text{ N.}$$

Equivalent to nitrogen _____ 9.74 per cent.

Theory _____ 10.07   "

It will be seen therefore that the Kjeldahl method will only yield correct results with such bodies as are easily decomposed, giving off their nitrogen in the shape of ammonium sulphate. The volatility of a compound in this process is not a source of error, for Kjeldahl himself analyzed such bodies as trimethylamine and obtained correct results.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

On the Atomic Weight of Glucinum.   T. S. HUMPIDGE.

The author has prepared a sample of metallic glucinum having the following composition, viz.: Gl 99.20, Gl O, 0.70, Fe 0.20. He has determined the specific heat of this sample at varying temperature up to 450° C, and has constructed a curve embodying these results. This curve rises rapidly to 400°, is nearly constant from 400° to 500°, and reaches a maximum at 470°, but it is doubtful whether it it can be relied upon above 500°. The specific heat between 400° and 500 is .62, and this multiplied by 9.1 gives 5.64. Glucinum, therefore, like carbon, boron and silicon, conforms to the law of Dulong and Petit only at high temperatures. The atomic weight 9.1 conforms to the periodic law, while 13.6, the weight deduced from the specific heat of the metal between 10° and 100° C does not. The conclusion is confirmed by determinations of vapor density of glucinum chloride and bromide. The author considers that deductions from the periodic law will be important factors in future in fixing the atomic weight of an element. (*Chemical News*, 51, *121*.)   A. A. B.

Note on the Occlusion of Hydrogen by Zinc Dust, etc. G. WILLIAMS.

Ordinary zinc dust gave off 39 times its volume of hydrogen at a temperature short of the melting point of glass. Combustion of the zinc dust with cupric oxide yielded closely accordant results, showing that the occluded hydrogen is almost entirely expelled at a low red heat. The author makes suggestions as to the bearing of this result upon the conclusions drawn by Graham from an examination of the Lenarto meteorite. (*Chemical News*, 51, *147*. *From Journal of Gas Lighting.*)   A. A. B.

Eutexia.   T. TURNER.

A discussion of the results which have been classed by Guthrie under this head. A eutectic body, is a mixture of substances which remain associated during the process of cooling from a state of fusion and which maintains a constant temperature during solidification.

It possesses a constant fusing point which is lower than that of any mixture of the given constituents. Cryohydrates are eutectic bodies and mixtures of salts cooled from a state of fusion, or metallic alloys may show examples of the same class. The author suggests, upon theoretical grounds, that the force of cohesion in eutectic substances is at its minimum, and the molecular volume at its maximum. (*Chemical News*, 51, *133*.)   A. A. B.

On the Solution of Magnesium Carbonate in Carbonic Acid Water. (Second Paper.) R. Engel.

Pressure of CO_2 in Atmospheres.	Per cent. $MgCO_3$ dissolved.
0.5	20.5
1.	26.5
1.5	31.0
2.	34.2
2.5	36.4
3.	39.0
4.	42.8
6.	50.6

(*Comptes Rendus*, 100, *444*.)   C. E. M.

ORGANIC CHEMISTRY.

On Derivatives of Orthoxylol. ADOLF BAEYER and CARL PAPE.

Orthoxylylencyanide may be easily obtained by the action of KCN on orthoxylylenbromide. M. P. 59 — 60° C. Easily soluble in alcohol and ether. It is somewhat volatile when treated with a current of steam. If boiled with dilute NaOH, concentrated HCl, or dilute H_2SO_4 it is converted into orthophenylendiacetic acid—

$$C_6H_4 \begin{cases} CH_2 - CO\ OH \\ CH_2 - CO\ OH \end{cases}$$
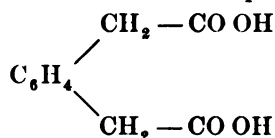
Orthophenylendiacetic acid crystalizes from water, or ether, in fine colorless needles which melt at 150° C. It is easily soluble in ether, alcohol and hot water. More difficultly soluble in cold water. Silver nitrate, added to a solution of its ammonium salt in water, precipitates the silver salt. (*Ber. d. chem. Ges., 1884, 447.*)

J. H. S., JR.

New Syntheses of Naphthaline Derivatives. ADOLPH BAEYER and W. H. PERKIN, JR.

In a previous communication it was shown that by the action of orthoxylylenbromide upon sodium malonic acid ether a compound is formed which the authors called hydrindonaphtendicarbo-acid, which may be looked upon as a derivative of an analogous naphthalene compound, composed of a ring containing six, and another containing five carbon atoms.

This was proved by producing naphthalene in the same way.

Tetrahydronaphthalinedicarbo-acid ($\beta\ \beta$).

Obtained from orthoxylylenbromide and sodium acetylentetracarbo-acid ether. The anhydride is insoluble in water. Dissolves better in hot NaOH + aq. The free acid is sparingly soluble in cold water, more so in hot water, and easily soluble in ether, chloroform, alcohol and acetone. Melts at 199° and is at the same time converted into its anhydride. The anhydride melts at 180° C.

Tetrahydronaphthalintetracarbo-acid ether, on being saponified, loses two mols. of CO_2, and is converted into the K salt of tetrahydronaphthalinedicarbo-acid. (*Ber. d. chem. Ges., 1884.*)

J. H. S., JR.

The Alkaloids of Nux Vomica, III : Some Experiments on Strychnine. W. A. SHENSTONE.

The author obtains bromstrychnine by adding bromine water to strychnine hydrochloride dissolved in 50 to 100 times its weight of water. From this solution alkalies throw down the substance as a solid insoluble in water, crystallizing well from warm alcohol. Bromstrychnine thus obtained is identical with that obtained by Laurent. The resin obtained by Laurent as a by-product, when bromine was made to act on strychnine hydrochloride is shown to be mono bromstrychnine dibromide. The chloro- compound obtained by Pelletier on completely precipitating a solution of strychnia with chlorine is believed by the author to be the dichloride corresponding to the dibromide above mentioned. When bromstrychnine is heated with excess of strong nitric acid for some hours there is formed a resinous precipitate consisting of nitrated bodies which have been partly examined by Nicholson and others, and *picric acid*, which has not been known hitherto as a product of this reaction. This formation of trinitrophenol appears to the author to indicate that stychnine contains a benzol ring of carbon atoms and, perhaps, one or more hydroxyl groups ; the latter inference is supported by the behavior of strychnine under the action of the oxidizing agents used. (*Jour. Chem. Soc.*, 268, 139).   A. A. B.

On the Physiological Action of Brucine and Bromostrychnine. T. L. BRUNTON.

The difference between the effects of brucine and strychnine appears to be one of degree rather than of kind, and to be chiefly dependent on the ready elimination of brucine. Brucine, like strychnine, produces death by convulsions and not by paralysis, but like curara, which is also a product of a species of *Strychnos*, it is innocuous when taken into the stomach though fatal when injected under the skin. Comparing his results with brucine and those of Frazer and Crum Brown on methylstrychnine iodide, the author

considers the two to have different action, the former causing convulsions, the latter paralysis. This point is worthy of investigation, as it may throw some light upon the constitution of the alkaloids. A somewhat similar case has been observed in the alkaloids of opium. In a class of alcohols known as *codeines* and resulting from the introduction of alcohol radicles into morphine there are certain ones, such as codethyline, $C_{17}H_{18}NO_2OC_2H_5^-$, in which the narcotic action is diminished, while, according to Von Schroeder, the convulsant action is increased, in proportion to the number of atoms of hydrogen replaced by alcohol radicles. If such be the case it is remarkable that by the addition of alcohol radicles to codeine or thebaine their tetanizing action should be altered into a paralyzing action, methylthebane producing paralysis like methyl-strychnine. Bromostrychnine has a physiological action very much like that of strychnine. The convulsions produced depend upon alterations in the function of the spinal cord and not on any action of the drug on the higher centres in the brain or medulla.— (*Jour. Ch. Soc.*, **268**, 143.)   A. A. B.

Crystallography of Bromostrychnine. H. A. MIERS.

The crystals are rhombic with the axes in the ratio a : b : c = 1.45907 : 1 : 1.19457. The crystals are colorless and transparent, brittle with conchoidal fracture, but without observable cleavage; almost all are rectangular tables with the large faces marked by striations.(—*Jour. Ch. Soc.* **268**, *143*.)   A. A. B.

Formation of Pyridine Derivatives from Malic Acid. H. O. PECKHAM and W. WELSH.

An attempt to ascertain the nature of the reactions by which the alkaloids are built up within the vegetable organism. Assuming in accordance with the suggestion of Koenigs that the alkaloids are pyridine derivatives, and further, that nitrogen is supplied to the organism in the form of ammonia and amido- compounds then non-nitrogenous carbon compounds must also take part in the reaction. It has already been shown by one of the authors that malic acid under the action of concentrated sulphuric acid splits up into formic acid and the half aldehyde of malonic acid. Two molecules of the latter in the nascent state, then un-

dergo condensation with elimination of two molecules of water
and form coumalinic acid, and coumalinic acid reacts with ammonia
at common temperatures to form hydroxynicotinic acid which as
a derivative of nicotinic acid stands in close relation to many of the
alkaloids. Primary amines and amido- acids behave like ammonia
with coumalinic acid, reacting with it to form hydroxypyridine-
carboxylic acids. Chelidonic and meconic acids which occur in
certain Papaveraecae exhibit many analogies with coumalinic acid
and react similarly with ammonia. As chelidonic and meconic
acids are invariably accompanied in the plant by malic citric and
similar simple vegetable acids as well as by alkoloids, it seems
probable that they bear a close generic relation to malic acid, cou-
malinic acid and the pyridine derivatives; the study of the pyridine
derivatives of malic acid is therefore of interest as a possible
means of throwing light upon the natural formation of the alkaloid.

In following up the subject the authors confine themselves in the
present paper to the examination of the products obtained by the
action of ammonia and amido- compounds on coumalinic acid or
rather upon its methyl salt, which, for reasons given, is more suit-
able.—(*Jour. Ch. Soc.* **268**, *145*.)   A. A. B.

On Propylenchlorhydrine. H. F. MORLEY and A. GREEN.

.   Although propylenchlorhydrine, obtained from different sources,
boils at 127–128°C., still it is not certain whether it always has the
same constitution or whether, at times, it is a primary body, $(CH_3$
$CHCl\ CH_2OH)$, and at other times a secondary compound $(CH_3$
$CHOH\ CH_2Cl)$. Occasionally, it might be composed of a mixture
of both. It has usually been assumed that chlorhydrine, obtained
by the action of water upon $CH_3CH(SO_4H)\ CH_2Cl$ is a second-
ary body. Markownikoff also claims that the compound obtained
by the action of hypochloric acid, upon propylen gas, is also a
secondary chlorhydrine. Henry, however, asserts that this chlor-
hydrine is a primary compound, as he obtained, on oxidizing it with
dilute nitric acid, a chlorpropionic acid. The authors have ex-
amined the oxidation product obtained from the chlorhydrine pro-
duced by the action of chloride of sulphur upon propylenglycol,
and conclude that it is a mixture of a primary and a secondary
chlorhydrine, in which the secondary body predominates. (*Ber. d.*
chem. Ges., 1885, 24.)   J. H. S., JR.

Contributions to a Knowledge of the Ammonium Bases which may be derived from Chinoline. A. BERNTHSEN and W. HESS.

The following compounds are described:

Methylchinaldinium hydroxide.

$$C_9H_6(CH_3)_2 \text{ and } N,CH_3.OH.$$
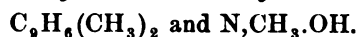
Obtained by treating chinaldine methyliodide snspended in ether, with an excess of alkali.

Methylflavolinium hydroxide.

$$C_{16}N,CH_3OH.$$

Obtained from flavolinemethyliode and KOH.

Benzylchinolinium hydroxide.

$$C_9H_7N, C_7H_7OH.$$
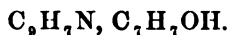
From benzylchinoline, and KOH.

Methylchinolinium hydroxide.

Obtained by heating a mixture of chinolinemethyliodide with KOH. (*Ber. d. chem. Ges., 1885, 29.*)   J. H. S., JR.

Researches on Isomerism in the Aromatic Series.— Heat of Neutralization of Polyatomic Phenols. BERTHELOT and WERNER.

		CALORIES.
Résorcine	$(C^{10}H^6O^4)$	16.397
Orcine	$(C^{14}H^8O^4)$	15.700
Hydroquinone	$(C^{12}H^6O^4)$	15.560
Pyrocatechin	$(C^{12}H^6O^4)$	8.267
Quinone	$(C^{12}H^4O^4)$	34.160
Phloroglucine	$(C^{12}H^6O^6)$	18.269
Pyrogallol	$(C^{12}H^6O^6)$	13.803

Neutralized with NaOH.

(*Comptes Rend.* 100, *586.*)   C. E. M.

On the Direct Replacement of the Amido- Group in Aromatic Amines, by the Halogens. S. M. LOSANITSCH.

A solution of aniline in hydrochloric acid was heated in a large flask, which was connected with a cooler. To this solution, con-

centrated HNO_3 was added in small portions. After each addition of HNO_3, a violent reaction takes place and a yellow oil distils over. The addition of HNO_3 was kept up until the aniline used had separated as a tarry mass. This mass was finally distilled in a current of steam. About ⅓ of the aniline used is converted into a yellow oil, which is found in the distillate. The tar above mentioned, on being boiled with aqua regia, yields chloranil. The yellow oil was found to be a mixture of chlorbenzol and chlorphenol. The chlorphenol was removed with KOII. About 75 per cent. chlorbenzol was obtained. (*Ber. d. chem. Ges.*, *1885*, *39*.)

J. H. S., JR.

Decomposition of Aqueous Solutions of Hypochlorous Acid and of Chlorine in Sunlight. A. POPPER.

Quantitative determinations were made of the decomposition products of hypochlorous acid exposed to sunlight in open vessels and in closed tubes. In the first case some free oxygen is evolved and also probably chlorine ; then $HClO_3$, 62.38% ; $HClO_4$, 3.33% ; HCl, 1.58%. In the second case oxygen 4.55%, $HClO_3$, 51.61 ; $HClO_4$, 2.86% ; IICl, 9.65. To see what influence chlorine, set free in the first part of the decomposition, had upon the remaining products, the decomposition of chlorine water was examined in open vessels and in tubes. In open vessels $HClO_3$ 10.93%, and HCl 40.60% were formed. In decomposition of chlorine water the chloric acid may be formed direct or may be indirectly formed from hypochlorous acid. In solutions of hypochlorous acid there seems to be primarily formed $HClO_3$, oxygen and chlorine. At the expense of the chloric acid and oxygen small amounts of perchloric acid were also formed, and the free chlorine acts upon the water as above. (*Annalen d. Chemie*, *227*, *161*.)   F. P. V.

High-boiling Phenols from Coal Tar. K. E. SCHULZE.

Green oil (500 kg.) was stirred with water and caustic soda, treated with naphtha and then neutralized with sulphuric acid. Fifty-two kilograms of the phenols, thus gotten, were purified by distillation under diminished pressure. The decomposition seemed slight, with separation of water and formation of hydrocarbons. These were removed, the phenols fractionated and one fraction

(150–200°) examined. It was found to contain β– and α naphtol. The author appends a discussion of the modes of formation of phenols in coal tar. (*Annalen d. Chemie*, **227**, *143*.) F. P. V.

Compounds of Uranyl Chloride with Ammonia. F. F. REGELSBERGER.

Uranyl chloride was gotten pure by crystallizing from ether, containing then two molecules of the ether. On passing ammonia into the solution in ether, a voluminous yellow precipitate was gotten, which was dried in vacuo over sulphuric acid. Its composition was UO_2 $(NH_3Cl)_2$. This is capable of taking up more ammonia if left in an atmosphere of the same. This diammon-dichloride yields UO_2 $NH_3(NH_3Cl)_3$. Uranyl chloride, under the same conditions, yields $UO_2(NH_3$ $NH_3Cl)_2$, as well as UO_2 $NH_3(NH_3Cl)_3$. Uranyl diammon-dichloride, treated with cold water, yields NH_4 Cl, ammon-uranate, uranyl chloride and uranyl hydrate ; with warm water more hydrate and less uranate, and dichloride are formed. Under gentle warming, ammonia and chlorine are lost. On igniting in air U_3O_8 is left; in hydrogen or ammonia, UO_2. (*Annalen d. Chemie*, **227**, *119*.) F. P. V.

Constituents of Certain Essential Oils. O. WALLACH.

Oil of cajuput on examination, contains the same principal ingredient as worm seed oil. Other essential oils are examined as to their containing cynen. The ease with which this body forms a crystalline tetrabromide is used as a means of identification. Its melting point is given as 124–125°. From *oleum corticis aurantiorum* a closely allied tetrabromide is gotten, melting at 104–105°. This the author calls hesperiden bromide. (*Annalen d. Chem.*, **225**, *314*.) F. P. V.

Contributions to the Chemistry of the Terpenes and Essential Oils. O. WALLACH.

As mentioned in the preceding paper two distinct tetrabromides are formed from the terpenes—hesperiden bromide (M. P. 104–105°) and cynen bromide (M. P. 125–126°). The bromides are formed by allowing .7 vol. bromine to drop in a cooled mixture of the terpene with 4 vols. alcohol and 4 vols. ether. The crystals

separate on evaporation. The lower boiling terpenes yield liquid
bromides. By heating the terpenes in sealed tubes to 250–270°
higher boiling fractions are gotten (180–190°) which yield crystal-
line bromides. From American turpentine oil the cynen tetrabro-
mide was gotten after heating to 250–270°, and after treatment
with hydrochloric acid or with nitric acid. Many other ter-
penes and essential oils were also examined. (*Annalen d. Chem.*,
227, *277*.)   F. P. V.

Oleum Cynae—A Contribution to the Knowledge of the
    Terpenes. WALLACH AND BRASS.

The main portion of the oil distills over at 176–178° C. (Sp.
Gr. .92067 at 16°). Analysis confirms the belief that it consists
of an oxygenated compound $C_{10}H_8O$, with which is mixed certain
amounts of a hydrocarbon of the same boiling point, and small
amounts of a high boiling compound richer in oxygen. The separ-
ation is affected by treatment with gaseous hydrochloric acid and
distillation of the crystals with steam. The boiling point is
then 176°–177°C. (Sp. Gr. .92297 at 16°). This compound the
authors call cymol. It is optically inactive. On oxidation with
nitric acid it yields oxalic acid. The hydrochloric acid compound
is decomposed by water. On heating in a tube it yields a terpene
and aqueous hydrochloric acid. Hydrobromic acid acts very
similarly. Hydriodic acid gives a more stable crystalline compound
which yields the same terpene (cynen) when gently heated with
aniline. Bromine gives interesting compounds. Experiments dis-
proved the assumption that cymol, as an isomer of borneol, con-
tained hydroxyl. Also it seems unlikely that the oxygen is united
to carbon with double bonds. Cynen is changed into cymol by
heating with concentrated sulphuric acid. (*Annalen d. Chem.*, **225**,
291.)   F. P. V.

Contributions to the Chemistry of Mercury Fulminate.
    A. EHRENBERG.

Aqueous hydrochloric acid, acting upon mercury fulminate,
causes the formation of hydroxylamine hydrochlorate and
formic acid. Since both nitrogen atoms go to form hy-
droxylamine the assumption that the fulminic acid is
nitroacetonitril seems untenable. Aqueous sulphocyanic acid de-

composes the fulminate, forming carbonic acid and ammonium sulphocyanide. Probably hydroxylamine sulphocyanide was first formed, but its instability caused the change into the ammonium salt. Fulminic acid does not seem capable of a free existence. The greatest care could not prevent the explosive decomposition of the supposed acid gotten by the action of dry hydrochloric acid. Ammonium sulphocyanide acts very similarly to the alkaline chlorides, only with more energy—fulminuric salts are formed. On adding the ethereal solutions of the product gotten by the action of dry hydrochloric acid, to ammonia, an isomer of common fulminuric acid is formed. (*Jour. f. prakt. Chem.*, 30, 68.) F. P. V.

ANALYTICAL CHEMISTRY.

On the Reduction of Arsenic Acid Solutions. L. W. McCoy.

The difficulty attending the reduction of arsenic acid in solution by sulphuretted hydrogen, has led the author to a modification of the method of Wöhler (i. e., treatment with sulphurous acid) in order to effect this reduction. Sulphurous oxide in water solution is added to the solution of arsenic acid, together with a few drops of dilute sulphuric acid, and the mixture is then heated for an hour in a tightly stoppered bottle on the water-bath. The reaction under pressure is much more effective than in Wöhler's method, in which no pressure is applied. (*Chemical News*, 51, *122.*)

A. A. B.

On the Determination of Graphite in Minerals. J. B. Mackintosh.

By fusion with caustic potash in a silver crucible and subsequent treatment of the melt with water, all matters associated with graphite in a rock are rendered soluble or separated in flocculent masses, the graphite alone remaining unchanged. The insoluble mass is washed in a Gooch filter, first with water, then with HCl, and finally with ammonia to remove traces of silver acquired from the crucible. Graphite remains unaltered and is weighed as such. (*Chemical News*, 51, *147.*) A. A. B.

On the Separation of Alumina and Ferric Oxide. P. VIGNON.

The process is founded on the fact that trimethylamine precipitates ferric oxide and alumina, but redissolves the latter.

A large excess of concentrated trimethylamine is added at once, and allowed to stand for 24 hours. The precipitate is washed several times with trimethylamine by decantation, and finally thrown on a filter and washed until a drop does not leave on evaporation a sensible residue. The precipitate is well dried, incinerated and weighed.

Trimethylamine also redissolves chromic oxide. (*Comptes Rend.* **100,** *638.*) C. E. M.

INDUSTRIAL CHEMISTRY.

Composition of Gaseous Products in the Combustion of Pyrites, and Influence of Glover's Tower on the Manufacture of Sulphuric Acid. M. SCHEURER-KESTNER.

The effect of Glover's (besides increasing the capacity of production of the system 15 to 18 per cent.), are : the condensation of the anhydride produced in the furnace ; the reaction of the sulphurous acid on the very limited quantity of nitrous acid encountered there, and the known reaction of the gases of the lead chambers which commences in the Glover's tower. The gas from the combustion of pyrites contains sometimes as high as 9 of sulphuric anhydride to 100 of sulphurous. (*Comptes Rend.*, **100** *636.*)

C. E. M.

Abstract of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

March 24th, 1885.

314,256.—Composition for cleansing metals.—O. H. Mellum.

Consists of oxalic acid, tripoli, aniline, and pure water.

314,281.—Filter.—A. N. Wilson.

314,342.—Manufacture of hydrogen.—G. E. Moore.

The process consists in the continuous introduction of gases and vapors containing carbon, simultaneously with steam, into a chamber containing a metallic oxide, and passing the resulting mixture of hydrogen and carbonic acid through carbonate of soda or potassa, or solutions in which these may be formed.

314,368.—Apparatus for distillation of hydrocarbons.—R. Dean.

314,400.—Apparatus for the manufacture of gas.—T. G. Springer and G. W. Jeremy.

Brief. The lower portion of a deep body of fuel is raised to incandescence, and the upper portion thereof is highly heated by an air blast at the bottom, and the resulting gaseous products are burned in a fixing chamber below the fuel chamber. After heating up, steam is superheated by passage down through the cooler portion of the fuel, and then decomposed by the passage down through the incandescent portion. The resulting water gas is carbureted by liquid hydrocarbon sprayed into it in the heated fixing chamber, and thus circulated until an intimate mixture is effected, after which such mixture is converted into a fixed gas by passage down through the heated fixing chamber.

314,412.—Hydrocarbon gas machine.—H. Alexander.

314,447.—Soap.—J. Hoogland.

Soap compound consisting of tallow, sal soda, resin, milk, lemons, soapstone and water of lime.

314,448.—Apparatus for manufacturing oil gas.—B. C. Smith.

Brief. Oil is vaporized in a coil of pipe, and the resulting vapor made into a fixed gas by passage through a heated chamber of large diameter. Air is forced into the gas on the way to the holder, and the mixed gas and air pass from a perforated pipe into the water in the holder tank, whereby impurities are washed out.

314,488.—Apparatus for freezing paraffin oils.—J. Teagle.

314,490.—Apparatus for refining oils.—J. Thomas.

314,504.—Process of purifying pig iron.—J. P. Witherow.

The process consists in blowing or oxidizing the metal, and removing the silicon, phosphorous and other impurities by successive discharges of slag during the continnance of the blow.

314,505.—Ingot iron and steel.—J. P. Witherow, H. W. Oliver, jr., J. F. Wilcox and G. E. Tener.

Phosphor ingot iron or steel, practically free from silicon, and low in carbon.

314.506.—Process of making ingot iron and steel.—J. P. Witherow, H. W. Oliver, jr., J. F. Wilcox, and G. E. Tener.

314,531.—Insecticide Composition.—F. M. Howard.

Consists of bisulphide of carbon, roll sulphur, carbonic acid, and phosphorus.

314,548.—Purifying sulphuric acid.—G. Thomson and W. Kemp.

The acid is purified by adding ammonium sulphide and filtering.

March 27th, 1885.

313,861.—Apparatus for purifying gas.—A. O. Granger.

313,979.—Apparatus for separating oil vapors.—J. E. Bicknell.

314,003.—Process of purifying water.—T. W. Duffy.

314,004.—Process of purifying metals.—C. Edwards.

Moist hydrogen is pass over the metal, while at a temperature 600–700° C, in an air tight retort.

314,038.—Brine-cooling apparatus.—C. G. Mayer.

314,039.—Gas-cooling apparatus.—C. G. Meyer.

314,096.—Process of making whiskey.—F. M. Young.

314,097.—Artificial fuel.—H. Aigner.

Consists of perforated blocks of a mixture of coal tar pitch and vegetable fibre, which are subsequently coked.

314,113.—Process of preparing iron ores for smelting.—M. R. Conley.

The finely divided ores is mixed with about five per cent of pitch, and formed into bricks, etc.

314,114.—Manufacture and preservation of articles of gypsum, stucco, or the like.—M. Dermstedt.

The articles are treated with a hot saturated solution of strontia or baryta, and dried in the presence of carbonic acid gas.

314,150.—Filter.—H. Roeske.

314,182.—Compound for repairing stoves, fire brick, etc.—E. Ivett and A. George.

Consists of a mixture of burned and ground fire clay, unburned and ground fire clay, sifted wood ashes, sand, salt, black lead, asphaltum and water.

314,199.—Apparatus for tanning.—L. Simpson.

341,200.—Apparatus for tanning.—L. Simpson.

Issued April 7th, 1885.

315,086.—Muffle furnace for assaying and annealing.—J. Haskins.
This is a furnace for burning gaseous or liquid fuel.

315,089.—Process and apparatus for roasting ores.—O. H. Tobey.

315,096.—Puddling furnace.—J. Webb.

315,265.—Apparatus for refining copper by electrolysis.—M. G. Farmer.

315,266.—Apparatus for obtaining aluminium.—M. G. Farmer.

April 14th, 1885.

315,471.—Roof paint composition.—D. Brobst.
Mixture of coal tar, asphalt, salt, alum, gypsum, Roman cement, sulphur, pine resin, slacked lime, tallow, and copperas.

315,487.—Composition mastic for covering roofs, telegraph wires, etc·
—A. Derrom.
Consists of crude Trinidad asphaltum, beeswax and oil.

315,549.—Hydrocarbon burner.—J. Reilly.

515,587.—Apparatus for the manufacture of iron and steel.—J. P. Witherow.

315,595.—Coke, oven.—E. J. Bowen.

315,597.—Manufacture of varnish from sludge tar.—R. M. Brenig.
The sludge is treated with a soap compound to separate the acid, and combine with the tar or oily compound. The resulting mass is dried and dis_ solved in linseed oil or turpentine.

315,610.—Chemical fire extinguisher.—W. Gee.

315,633.—Electrical insulator.—H. Kellogg.
A compound consisting essentially of asphaltum and caoutchouc oil.

315,709.—Apparatus for making gas.—E. Brook.

315,711.—Manufacture of hydraulic cement.—R. Bryce.
Limestone and Leitchfield marl or shale are ground together and pressed into bricks, which are then burned and ground.

315,747.—Gas generator.—A. Detwiler.

315,751.—Furnace for manufacturing illuminating gas.—T. Egner.
Brief. Bituminous coal is distilled in the upper part of the furnace while the coke, from which the gas has been evolved, is burned by the admission of air in the lower part of the furnace, and the gas evolved by distillation and that produced by combustion are passed together through the same eduction pipe connecting with the side of the furnace above the air inlets at a distance about one-third the height of the furnace. Tarry vapors and gas given off from the upper portion of the coal must pass down through heated coal and coke to the eduction pipe and are thus converted into fixed gases.

315,830.—Baking powder.—A. Peter·.
Consists essentially of boric anhydride and an alkali carbonate.

315,831.—Phosphate baking powder.—A. Peters.
Consists essentially of a carbonate of an alkaline earth or of an alkali with metaphosphoric and pyrophosphoric acids.

315,832.—Baking powder.—A. Peters.
Consists essentially of boric acid and magnesium carbonate.

315,837.—Revivifying filtering material.—J. W. J. Reford.
The filtering material is revivified or carbonized by a current of super-heated steam.

315,846.—Metallurgic gas furnace.—J. S. Seibert.

315,876.—Process of preparing and purifying wort for brewing purposes. — C. Limmer.
The wort is boiled with hops, cooled and filtered through a layer of hops. The wort is then refrigerated to precipitate the albuminous matter and passed through a centrifugal machine.

315,898.—Amalgamating pan and settler apparatus for treating ores.—M. P. Boss.

315,982.—Production of chlorinated derivatives of benzaldehyde.—R. Gnehm.
The benzaldehyde is treated with iodine and antimony pentachloride and heated.

315,953.—Process of purifying water gas.—O. Lugo.
. The carbonic oxide is removed from the water gas by first converting it into carbonic acid in contact with heated ferric oxide, and passing it in contact with caustic alkali. The metallic iron formed is constantly restored to the condition of ferric oxide by passing through it an oxidizing agent alternately with the gas.

315,980.—Manufacture of beer.—J. B. Von Rose.
Uses whole freshly prepared green malt in place of the usual dry crushed malt.

April 21st, 1885.

316,033.—Apparatus for carbureting and odorizing natural gas.—S. J. Hayes.

316,036.—Coloring matter derived from naphthol.—O. Hoffmann.
Green coloring matters produced by the action of nitrosonaphtholsulphonic acids, or their salts upon iron or its salts, or by the reaction of nitrous acid upon naphtholsulphonic acids treated with iron or its salts.

316,058.—Apparatus for extracting paraffine from oils.—C. H. Prentiss.

316,059.—Gas burning apparatus.—A. Randol.

316,067.—Process of brewing beer.—J. Schafhaus.
The wort is drawn from the mash in the tun until it begins to run cloudy.

The grain remaining in the tun is then sparged and stirred with water heated to 70–75° R., after which this latter wort is drawn off until nearly all extract is obtained. The wort is then pumped into a tun, containing a crib filled with hops, juniper berries, elemi-gum, and salt, boiled at a high degree until clear, and pumped into the sparger of the hop kettle for sparging the remaining hops.

316,075.—Water and alkali-proof fabric.—J. H. Stebbins, Jr., and P. Casamajor.

Woven vegetable fabrics are treated with sulphuric acid and alkalies.

316,104.—Extracting glycerine from fatty matters.—B. T. Babbitt.

Steam is passed through fatty matter under pressure and a sufficient temperature to decompose it and take up in suspension the separated glycerine. The steam and glycerine are afterwards condensed together and the water is evaporated off from the steam.

316,145.—Process of and apparatus for producing fodder from residual products of distilleries and breweries.—H. Hencke.

This is a process for producing dry concentrated fodder from the residual products of distilleries, breweries and sugar and starch factories. It consists in the decantation of the waste under admixture of a glutinous solution for precipitation of the albuminous and heavier particles, the deoxidation of the waste freed from water by the addition of calcium carbonate, and the evaporation and drying of the waste mixed with sodium carbonate.

316,195.—Manufacture of chlorine.—E. Solvay.

Uses in the manufacture of chlorine, a composition consisting of calcium chloride, silica, alumina and the residue remaining from a previous treatment of the composition.

316,233.—Blast furnace.—F. Brown.

316,248.—Formation of methoxy- and ethoxychinaldine.—O. Doebner.

Oxymethyl and ethyl derivatives of chinaldine.

316,249.—Formation of the hydrobase of chinaldine.—O. Doebner.

316,277.—Apparatus for making granulated crystalline sodium carbonate. —J. Maclear.

316,300.—Manufacture of hydrochloric acid.—E. Solvay.

Uses in the manufacture of hydrochloric acid, a composition consisting of calcium chloride, silicious clays, and the residues from the manufacture of hydrochloric acid.

316,367.—Method of manufacturing malt liquors from starch, etc.—W. T. Jebb.

The wort is prepared by mashing starch with barley malt.

316,373.—Colored lead for pencils.—S. Kraus.

A composition consisting of coloring matter, talc and potter's clay boiled in fat or oil.

816,381.—Apparatus for the manufacture of ammonium sulphate.—C. Meyer, Jr.

816,385.—Hydrocarbon vapor burner.—G. Myers and J. B. Wallace.

816,400.—Apparatus for refrigerating paraffine oils and other liquids.—H. H. Rogers and C. Vose.

816,404.—Manufacture of starch.—J. C. Schuman.

816,405.—Manufacture of starch.—J. C. Schuman.

The method of manufacturing starch from Indian corn or maize consists in first steeping the corn whereby the starchy portions and the germs are swelled and the skins are toughened, detaching the skins and germs from the starchy portions by whipping or beating without water, and then separating the skins and germs from the meal by sifting.

816,406.—Method of treating and preparing starch.—J. C. Schuman.

W. R.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—Held May 1st, 1885.

Prof. A. A. Breneman in the chair.

The minutes of the meeting of April 3d were read and approved. The minutes of the meeting of the Board of Directors, April 17th, were also read.

The following papers were then presented :

Determination of Metallic Zinc in Zinc Dust, by M. Liebschütz.

Note on the Analysis of Butter, by M. Liebschütz.

Silver Iodide as a Blowpipe Reagent, by P. Casamajor.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

SILVER IODIDE AS A BLOWPIPE REAGENT.

By P. Casamajor.

In the *Chemical News* of February 20th, 1885, is a paper by
Messrs. Wheeler & Ludeking on reactions of various metals, ob-
tained by heating their compounds with tincture of iodine. Coat-
ings of various colors are deposited on the support, which in many
cases are striking and characteristic. The support used by these
investigators is a thin plate of plaster of Paris, on the white surface
of which the colors of the deposits are brilliantly displayed. The
compound to be examined is placed on this plate, near the edge ;
alcoholic tincture of iodine is poured over it, then the blowpipe
flame touches it for a very short time, giving rise to the coatings,
which deposit on the plate, beyond the point touched by the
flame.

I have repeated the experiments of Messrs. Wheeler & Ludeking
on lead, mercury, tin bismuth and molybdenum. The results were
eminently satisfactory. As tincture of iodine may be found at any
country apothecary's, it is interesting to know that it may be used
to obtain characteristic reactions with the blowpipe, in case of need.

These experiments of Messrs. Wheeler & Ludeking suggested the
idea of using silver iodide to obtain the same results. This reagent
was found, on trial, to give the iodide coatings very beautifully
and quickly. Silver iodide has the advantage over tincture of
iodine that it is a dry powder, easily kept in bottles which need
not close very perfectly.

The iodide coatings of mercury, bismuth and lead are familiar to
all chemists who use a blowpipe. They are obtained by Von Ko-
bel's mixture of equal parts of sulphur and of potassium iodide.
Silver iodide has over this mixture the advantage that there is
no sulphur to give deposits when operations are carried on in glass
tubes, and no fumes of sulphur dioxide. It requires less time to
obtain the coatings, and they have a more distinct appearance.

In experimenting with silver iodide mixed with various metal-
lic compounds, I have deposited the iodide coatings in open glass
tubes of about 4 inches in length and ¼ inch in diameter. The sub-
stance to be tested is mixed into a paste with the silver iodide. A
small portion of this mixture is placed at one end of the open tube
and the blowpipe flame is blown on it for a short time. The iodide

coatings immediately appear and are seen through the glass. The glass tube may be held by a tongs or simply by a piece of paper, as the blowing is not sufficiently prolonged to heat the glass tube beyond what paper will stand.

A small quantity of powdered charcoal or lamp black, mixed with silver iodide and the substance to be tested, gives the characteristic coatings more quickly and distinctly.

The following metals have given iodide coatings in glass tubes :

Mercury.—In tubes, as on other supports, the yellow and red iodides are produced simultaneously, and streaks of bright red are seen on a yellow ground.

Bismuth.—Yellowish red near the end of the tube, and thick brown coating beyond.

Lead and Tin.—Both these metals give bright yellow deposits which retain their color when cold. These deposits cannot be distinguished one from the other, both being equally bright. In the case of tin a very strong smell of iodine is given off, which is possibly due to stannic iodide.

Arsenic.—Near the end of the tube to which the flame is applied, there is a yellow deposit ; beyond this a white coating of arsenious acid. The yellow portion turns white on cooling, but becomes yellow again when the tube is heated over a flame.

Antimony.—The orange red coating given by this metal becomes quite faint on cooling, but the color becomes bright again when the tube is heated.

Zinc.—The deposit is white both when cold and when hot. The fumes are not very abundant ; much less so than those due to lead or tin.

Iron makes a deposit which may be considered as characteristic, from the fact that the yellow coating in the tube is streaked with distinct dashes of brown. The yellow portion becomes white on cooling, but the brown streaks do not change.

Thallium.—A yellow coating is deposited, as with most metals. After this has taken place, if a reducing flame touches the deposit, this fades, leaving a gray tinge with an edge of purple. This seems to be characteristic of thallium.

Cæsium, Rubidum and Lithium have not given deposits which can be called characteristic. The deposit from cæsium differs from those of the other two metals in being less volatile. The cæsium

deposit does not extend far beyond the heated end of the tube. By increasing the heat it melts, but does not move forward.

Chromium gives a white coating which remains at the hot end of the tube. The portion nearest to this end, by further heating, becomes of a pale, reddish brown.

Manganese.—Yellow hot, but white when cold, like deposits from many other metals.

Molybdenum.—Beyond the yellow coating, which turns white on cooling, are distinct blue streaks, which are very characteristic. I believe these were first observed by Messrs. Wheeler & Ludeking by treatment with tincture of iodine, on tablets of plaster of Paris. I was not able with these tablets to get anything but a narrow fringe of blue around the yellow coating (white, cold). With a glass tube, the blue streaks extend through the whole length of the tube.

Manganese and Uranium give deposits which are yellow when hot and white when cold. These are too common to be characteristic.

I have obtained deposits on charcoal and on thin sheets of iron, either on the metallic surface or on a coat of soot, by the use of silver iodide and metallic compounds. Some of these deposits are very good, but they are not so uniform for the same metal as deposits obtained in glass tubes.

ON THE EXAMINATION OF BUTTER.

By Morton Liebschütz.

Although it does not seem a matter of much importance, in the abstract, whether the fatty body used as food is derived from the fatty deposits of the animal, or from the emulsion called milk, the chemist is often compelled to decide whether a given sample is genuine butter or an imitation.

Dalican has given a method based on the percentage of *insoluble* fatty acids. He asserts that, as a nearly general rule, pure butter yields 86.5% of fatty acids while oleomargarine shows only 93.75%. His method which is excellent when time permits, and only a few samples are to be tested, is too tedious for general use. The washing of the fatty acids of pure butter requires at least two days, it being considered complete only when the water used for the operation remains perfectly neutral.

The determination of the glycerine would be, I think a shorter way of examination, and David's method of saponification by barium hydrate might be used with advantage. David proposed the method for the so-called titration of tallow, his plan being to extract the gylcerine from a large sample of fat (100 grms.), to bring the glycerine to a known volume and to take its specific gravity. Knowing the percentage of glycerine contained in solutions of determined specific gravity, he calculated the yield in glycerine from the fat treated. This method has not, so far as the author is aware, been adopted, and it is doubtful if it will be. First of all the glycerine obtained is impure, containing compound salts of glycerine and baryta. For this reason the results are liable to vary with the different fatty bodies; the glycerine of each different fat will contain proportions of saline matters different from the glycerine yielded by the fat taken as a type, the solutions of which have been regarded as containing the standard amount of glycerine. Although we know that the *volumetric* determination of glycerine, or more properly the hydrometric determination cannot be used, the process of saponification may be applied with advantage to the examination of butter. We shall describe the method as it might be used for butter analysis. David's paper will be found in *Comptes Rendus*, 1882.

The sample of butter, so-called, is first melted in the air bath at 70°C. The clear fat rising above the water, salt and other impurities is decanted through a small dry filter, placed in a warm funnel, and the filtrate is collected in a small dish. About 20 grammes are taken, allowed to cool, and weighed, together with a small spatula. 10 grms. are removed and placed in a porcelain capsule of about 500 c.c., heated on a steam or water bath and when the fat is very warm 20 grms. of barium hydrate (9 mols. water) are added. When the emulsion has formed, pour in 30 c.c. of hot alcohol at 90°C., stirring briskly until the mass is nearly dry.

· Add 200 c.c. of cold water; break the mass of barium soap with the spatula and boil, to reduce the liquid to one-half. Cool for a time, decant through a linen filter, repeating the boiling and the decantation three times at least, then, finally, throw the whole contents of the capsule upon the filter, after dividing the soap finely with a small pestle. Wash the filter with a few c.c. of water, and squeeze it with the fingers. Evaporate all of the solutions to about

100 c.c.; add litmus and neutralize cautiously with dilute sulphuric acid. Neutralize the slight excess of acid with barium carbonate. Filter the solution, wash the filter, and evaporate the liquor to a syrupy consistency.

As has already been said the glycerine so obtained is not pure. Treat the contents of the capsule with strong alcohol; a large quantity of salts is thrown down. The alcoholic solution is filtered through a small filter, previously moistened with alcohol, and the filtrate is collected in a tared platinum or porcelain dish. Evaporate the alcohol on the water bath and dry in the air bath above 100°C. to constant weight. After noting this, heat the glycerine, and burn it. The weight of the ash is deducted from the total weight; the difference is glycerine. The percentage of ash compared with the total percentage of glycerine is by itself an important factor, as glycerine derived by this mode of treatment from pure butter gives 5% of ash, whereas the glycerine of oleomargarine and other similar fats leaves only from 0.3 to 0.6%.

By this method I have found, after deduction of said ash, 3.75% glycerine in pure butter ; 7% glycerine in oleomargarine.

DETERMINATION OF METALLIC ZINC IN ZINC DUST.

By MORTON LIEBSCHÜTZ.

Fresenius has given a method based on the decomposition of acidulated water by the metallic zinc that is one of the constituents of zinc dust or tutty. The hydrogen evolved is converted in water, the weight of which answers to a definite amount of zinc. This method requires all the apparatus of an organic analysis; and although the results are accurate the daily increasing use of this zinc dust, requires that samples may be tested quickly, or compared one with the other, without loss of time and without necessitating costly manipulations.* The following method will, I think, answer the purpose when a very close estimation is not required :

Weigh out about 1 grm. of the sample, after removing metallic iron with a magnet, moisten the sample, in a beaker, with alcohol; stir with a small platinum spatula, or a piece of platinum foil, and,

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*The occlusion of hydrogen by zinc dust recently noted by G. Williams, adds a new difficulty in the use of Fresenius' process.

while stirring, pour at once into the beaker a warm neutral solution of cupric sulphate (5 grms. sulphate to 1 grm. of zinc dust). Digest for a few minutes, acidulate with a few drops of dilute sulphuric acid, to remove metallic oxides, allow the divided metallic copper to settle, and decant the solution containing the excess of sulphate used upon a small filter; wash several times by decantation with tepid water, always pouring the washings over the filter until no copper can be detected in the filtrate with ferrocyanide.

Dissolve the divided copper in nitric acid, burn the small filter with its contents, and dissolve in a few drops of nitric acid. Put the two solutions into a graduated flask, complete the volume with water and titrate with a standard solution of potassium cyanide using an aliquot portion of the copper solution. The weight of the copper multiplied by 1,031 gives the metallic zinc.

As lead occurs often, and perhaps always in zinc dust, and as its presence is troublesome in the copper titration, it is preferable to treat the two nitric acid solutions, evaporated together to a small volume with sulphuric acid and to throw down lead in the form of sulphate. Collect the lead sulphate on a small filter. The filtrate free from the lead is collected in a graduated flask, and the washings of the filter are used to complete the volume. By so doing we determine also, without changing the method of analysis, the foreign metals of the zinc dust.

Although pure zinc as finely divided as it is in zinc dust could not be obtained, the results with very finely filed, pure zinc gave results varying from 95 to 98%. It is to be supposed that at least 99% would be found in pure zinc if it were as finely divided as it is in zinc dust.

Various samples of zinc dusts have shown 85 to 98 % of metallic zinc. A sample represented by the seller to contain 99.5% of metallic zinc was found to contain more than 1% of metallic lead; and the yield in zinc, even supposing that 98% only of the true proportion had been detected by this process was 86%. Even with 96% of pure zinc, however, a zinc dust would be a creditable product and the claim of 99.5 is preposterous.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Remarks on the Principle of Maximum Work.—M. BERTHELOT.

The author regards his recent work on the distribution of bases between HCl and HF as an additional demonstration of the value of the above principle in the prediction of chemical reactions. Two fundamental data are necessary, viz., a knowledge of the quantities of heat disengaged by the reaction within a given system and a knowledge of the dissociation which limits the reaction and determines an equilibrium. There is no absorption of heat in chemical reactions, apparent absorption is due to physical phenomena which accompany the reaction, such as change of state, dissociation, change of specific heat, etc., all of which obey the known laws of physics and thermodynamics. Thermodynamical theorems in which the transformation of heat into work is limited by the temperature at which this transformation is effected are applicable only to chemical phenomena in which there is a reversible intervention of calorific energies, e. g. of dissociation or change of state, and possibly also, in cases in which there is a difference of specific heat between the initial and resulting bodies. Chemical affinity, so far as it can be measured by the heat disengaged in a reaction, is expressed by the sum of two terms; one expressing heat disengaged at 273° C., for example, the other variable with the absolute temperature. The second term is eliminated or reduced to its lowest value in such reactions as the union of perfect gases uniting without change of volume, or of solids in which the specific heat and the volume, respectively, of the compound are the sums of those of their elements. The factor of heat disengaged which varies with temperature can only acquire a notable importance in such cases as the above on condition that there is no limit to the action of dissociation. That all bodies do not tend to dissociate at all temperatures, has been demonstrated, however, by experiments which the author describes.

Dissociation is absolutely *nil* in water at common temperatures and union of its elements is equally impossible within the same limits. The limit of temperature at which combination or dissociation first become possible is an absolute limit and shows the existence of a law of discontinuity in chemistry which must not be forgotten in the theoretical application of thermodynamics to chemical phenomena. The law of definite proportions is another illustration of the same discontinuity.

Dissociation is necessary to the establishment of an equilibrium. Many chemical changes take place by a series of reactions in which intermediate compounds are successively formed and broken up. The equilibrium between salts, etc., in solution is principally maintained by the dissociation of such intermediate compounds. In order that an equilibrium may result it is necessary that the dissociable compound shall be produced by the reaction, which corresponds to the thermal maximum, and that the dissociation shall result in products which, by their action upon the system, can regenerate the dissociable body. These conditions are realized in the dissociation of $KHSO_4$ in presence of HCl. The dissociation of hydrated sodium acetate into water and acetic anhydride, on the contrary, yields no product which can react on NaCl, and there is, therefore, no reciprocal reaction between sodium acetate and HCl. The author refers to his own discoveries of the acid salts of the hydracids, the double salts of the halogens and the per-salts of the same, all of which throw light upon this subject. The supposed endothermic reactions between the halogens are shown to be really exothermic and to depend upon the existence of intermediate double salts, which are more stable at higher temperatures than the simple chlorides, bromides, etc. (*Bul. Soc. Chim.*, **43**, *264*.)   A. A. B.

Alloys of Indium and Gallium.   L. DE BOISBAUDRAN.

The violent action of water on the alloys of aluminium and gallium makes interesting the examination of the alloys of gallium with the third metal of the same family, indium.

The points of complete fusion are difficult to determine, because, beginning at the temperature where the first signs of liquiaction

are manifest, the fluidity increases gradually, the metal remains
more or less pasty for a long time, and thus forms a mixture of
liquid and crystalline grains.

The following alloys were prepared:

2 In + Ga (In—227.0 and Ga—69.9, by weight).

Alloy white, granulated, easily sliced with a knife, softens and
crumbles easily at 46°, gives signs of fusion at 56°, viscid at 75°.

In + Ga (In—113.5, Ga—69.9).

Alloy white, nearly solid, but much less hard than the pre-
ceding. Hard at 16°, creamy at 45°, liquid at 60° to 80°.

In + 2 Ga (In—113.5, Ga—139.8). Soft, pasty, white alloy. Hard
at 16°, buttery at 18°, liquid from 60° to 80°.

In + 4 Ga (In—113.5, Ga—279.6. White alloy. Commences to
melt at 16.5°, creamy at 35°, liquid at 50°. (*Comptes Rend.*, **100,**
701.)   C. E. M.

On the Decomposition of Salts by Water. H. LECHAT-ELIER.

The general principles previously enunciated by the author
on the subject of the decomposition of salts by water (*Comptes
Rend.*, Nov. 10, 1884), lead to the two following consequences :

1st. The quantity of free acid necessary to arrest the decompo-
sition of a dissolved salt increases indefinitely with the proportion
of this salt contained in the liquid.

2d. The decomposition of a dissolved salt increases or diminishes
with elevation of temperature, according as that decomposition
absorbs or disengages heat. *Comptes Rend.*, 100, *737.*)   C. F. M.

The Chromium and Manganese Compounds corresponding to the Red and Yellow Prussiate of Potash. O. T. CHRIS-TENSEN.

The author has examined the methods proposed for the formation
of these salts, noting the conditions favorable to large yields, im-
provements in the older methods, etc. He also appends remarks
upon the colors of the respective double cyanides. (*Jour. f. prakt.
Chem.*, 31, *163.*)   F. P. V.

Hand-regulator for Projection of Spectra by Electric Light. J. WALTER.

To avoid the troublesome and difficult manipulation at present in use, the author uses a brass disc provided with sockets for carbon pencils around its periphery. These points can be soaked in the desired salt solutions and brought into the circuit as desired. For full description and for diagrams, reference must be had to the original article. (*Jour. f. prakt. Chem.*, **31**, *116.*)   F. P. V.

ORGANIC CHEMISTRY.

Extraction of the Green Material of Leaves: Definite Combinations formed with Chlorophyll. E. GUIGNET.

Isolated by the various known processes, chlorophyll is very soluble in alcohol, as well as in benzol and naphtha. However, green leaves or dried, either in a stove or in vacuum, will not abandon the chlorophyll to naphtha, but only a mixture of various yellow or uncolored materials. This singular fact cannot be explained, as might appear, by supposing that chlorophyll is contained in envelopes insoluble in naphtha, but soluble in alcohol.

In fact, dried leaves, pulverized and warmed with 95 per cent. alcohol give a deep green solution. In a mixture of ice and salt this solution forms an abundant deposit of uncolored or yellow matter insoluble in naphtha; it is probably this more or less complex substance which constitutes the envelopes containing the chlorophyll. What confirms this supposition is that dried and pulverized leaves, exhausted with naphtha, end with yielding a little chlorophyll to this solvent. Without doubt the envelopes, although but slightly soluble, finish however by being attacked by large quantities of naphtha. Besides, the finest green granulations contained in the leaves yield a little chlorophyll to naphtha, probably because they are not inclosed in resisting envelopes. This can easily be verified by crushing spinach leaves with a little distilled water, and passing the liquid through a fine sieve; some green grains are carried through and are deposited at the end of 24 hours.

the only product isolable by distillation is benzol; the residue is an asphaltic hydrocarbon.

If triphenylmethane is heated for ten hours at a temperature below the boiling point of benzol, with seven or eight times its weight of Al_2Cl_6, diphenylmethane is obtained which is easily isolated by distillation; the quantity being one-third of the triphenyl-methane employed.

Diphenyl heated with Al_2Cl_6 gives benzol and some black, resinous products.

Hexamethylbenzol is easily attacked by Al_2Cl_6 at a moderate temperature; when one-tenth of Al_2Cl_6 is employed, a regular disengagement of a non-chlorinated gas is produced; the gas is more carburetted than methane or ethane, and is not absorbed by bromine. After treatment with water, pentamethylbenzol and less methylated carbon compounds can be isolated by fractional distillation.

Naphthaline distilled with one-fourth its weight of Al_2Cl_6, at between 100° and 160° C., produces isodinaphthyl and a mixture of liquid hydrocarbons. (*Comptes Rend.*, 100, *692.*) C. E. M.

The Formation of Phenylangelic Acid and Phenylmethacrylic Acid, and the Behavior of Acetylphenyllactic Acid. F. L. SLOCUM.

A repetition of Perkin's experiments on the action of benzaldehyde on a mixture of acetic anhydride and sodium butyrate at 100°, instead of 180°, yielded no cinnamic acid but phenylangelic acid only. The reaction thus takes place between the aldehyde and the sodium salt, and not between the aldehyde and the anhydride. The formation of cinnamic acid at the higher temperature the author explains by the probable formation of sodium acetate and the reaction of the aldehyde upon this. By the action of benzaldehyde upon a mixture of acetic anhydride and sodium propionate only phenylmethacrylic acid is formed if the substances are carefully purified. On a mixture of acetic anhydride and sodium acetate, benzaldehyde reacts only at a temperature of 125°–145°, producing cinnamic acid. The author shows that phenyllactic acid and acetylphenyllactic acid cannot exist at this temperature when mixed with acetic anhydride in excess, consequently they could not be formed by the reaction. (*Annalen*, 227, *53.*) F. P. V.

p-Methylisatoic Acid and its Derivatives (*Preliminary Notice*). W. PARIAOTOVIE.

P-methyl-isatoic treated with acetic anhydride yielded an ethyl-derivative, $C_{11}H_9NO_3$, melting at 172°. A nitro- derivative was gotten by treating a solution of it in strong sulphuric acid, with potassium nitrate. The substance suspended in glacial acetic acid is oxidized by chromic acid, and yields an acid, $C_8H_7NO_3$, which stands to *p*-methylisatoic in the same relation as Kolbe's isatoic acid stands to isatin. This *p*-methylisatoic acid is with difficulty soluble in cold or warm water—more easily in boiling alcohol—crystallizes easily from acetone, and suffers decomposition at 215°. The action of hydrochloric acid, nitric acid, ammonia and aniline upon this acid has been examined. (*Jour. f. prakt. Chem.*, 31, 122.)

F. P. V.

Action of Phosgene upon Glycolchlorhydrin. J. NEMIROWSKY.

Liquid phosgene acting upon ethylenchlorhydrin causes the formation of hydrochloric acid and chlorethylchlorformic ether. This reaction takes place in closed tubes, without warming. The ether is a colorless, fuming liquid, with pungent, irritating odor. It is easily soluble in alcohol and ether, and boils at 150°–160°. It does not suffer decomposition on heating with water. With ammonia, hydrochloric acid and chlorethylenoxycarbonylamide are formed. The corresponding anilide compound was also formed. By treatment with conc. potash solution an anhydride of ethoxyloxycarbonylphenylamine was apparently formed. By heating this with fuming hydrochloric acid, in closed tubes at 170°, chlorethylphenylamine is obtained. The author is examining these substances still further. (*Jour. f. prakt. Chem.*, 31, 173.)   F. P. V.

Derivatives of Orthoamidobenzamide. A. WEDDIGE.

Acetylorthoamidobenzamide is formed by mixing 1 mol. acetic anhydride with 2 mols. orthoamidobenzamide. It crystallizes in colorless needles, melting at 170°–171°, and gives crystallizable salts with acids. Anhydroacetyl orthoamidobenzamide is gotten by heating the compound just mentioned until no more water is given off. It forms yellow needles, melting at 228°. A formyl derivative

-of orthoamidobenzamide is gotten with formic acid free from water, and on heating this it changes to an anhydride, melting at 209°. (*Jour. f. prakt. Chem.*, **31**, *124.*)   F. P. V.

A Chinolin Homologue (*Preliminary Notice*). C. BEYER.

On heating aniline with acetone, nitrobenzol and hydrocholric acid in a tube, a base was formed which, on nearer examination, proved to be a chinolin derivative—$C_{11}H_{11}N$. The platinum compound, the picrate, and chromate were analysed. The base, separated from the picrate by means of ammonia, is a slightly yellow oil with the chinolin smell. The author is engaged upon a more thorough examination of the base. (*Jour. f. prakt. Chem.*, **31**, *47.*)

F. P. V.

Substitution of Bromine for Phenolic Hydrogen. Bromated Tribromophenol. E. WERNER.

When bromine water is made to act on ordinary phenol, orcine, resorcine, or on the oxybenzoic acids, three atoms of hydrogen are replaced, and, in presence of excess of the reagent, a fourth atom, which is the phenol or hydroxyl hydrogen. The latter stage of the reaction is ordinarily impeded by the formation of flocks -of precipitate. The difficulty is avoided by the following process, which rests upon the method of Benedikt : An equivalent of phenol dissolved in 60 litres of water is treated with an equal volume of bromine water containing at least 20 grms. of bromine per litre. The latter is added rapidly to the solution of phenol, the solution is stirred slightly, allowed to rest, and stirred again, when the upper layers of the liquid become clear. The bromated tribromophenol is then deposited in crystalline scales, which, when purified, yield 78 % Br. (Theory for $C_6H_2Br_3OBr = 78.05$.) This product readily yields an atom of HBr under the action of potassium iodide, -or of soda solution, or even by prolonged contact with cold alcohol, while the remaining atoms of bromine are more strongly held. The thermo-chemical study of the reaction between bromine and phenol indicates that the three atoms of benzol hydrogen replaced correspond to 26.3, 20 and 22.1 Cal. respectively, while the fourth, ·or phenol hydrogen, yields only 5.3 Cal. The latter, therefore, is replaced only after the substitution of three atoms of B_2 for H in

the nucleus, and the two remaining atoms of hydrogen in t
nucleus can be replaced only by an indirect process. The auth
applies these facts to an hypothesis regarding the structure
benzol. The two hydrogen atoms unreplaced may represent
acetylene group distinct from the remainder of the molecule a
separately replaceable : e. g.

$$\left\{ \begin{array}{l} C_4H_4 \\ C_2H_2 \end{array} \right. \qquad \left\{ \dfrac{C_4H_4}{O} \right. \qquad \left\{ \dfrac{C_4H_4}{S} \right. \qquad \left\{ \dfrac{C_4H_4}{NH} \right.$$

Benzol.   Furfurane.   Thiophene.   Pyrrol.

(*Bul. Soc. Chim.*, 43, 372.)   A. A. B.
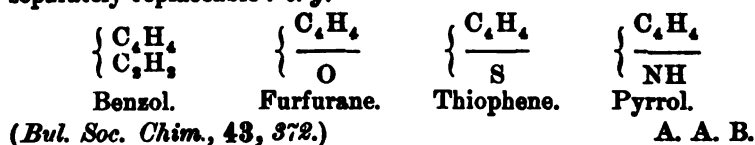
A New Method of Measuring the Heat of Combustion Carbon and of Organic Compounds.—MM. BERTHELOT a VILLE.

The method of explosion with compressed oxygen in a stro
receiver or " calorimetric bomb," yields results which are diffic
to attain by methods previously in use. The combustion is perfe
if oxygen at seven atmospheres be used and in such quantity th
not more than 30–40 per cent. of it shall be consumed. Igniti
is effected by a platinum wire rendered incandescent by ele
tricity. The calorimetric measurements proper requires only 3
minutes instead of 15–20, as heretofore. In the combustion
carbohydrates and of the soft charcoals used in gunpowder,
which carbonization is imperfect, an excess of energy is exhibit
as compared with that of the hydrogen and carbon which the
bodies contain and the water which they furnish by decompo
tion. Black charcoal, obtained at higher temperatures, confor
closely in its heat of combustion to pure carbon. (*Bul. Soc. Chi*
43, 262.)   A. A. B.

Studies on Commercial Picolin. A. LADENBURG and C. ROTH.

Commercial picolin, boiling from 125–145° C., was fractioned se
eral times, and finally separated into two distinct fractions, whi
boiled respectively at 132–135° C. and 139–142° C. These t
authors look upon as α and β-picolin. These two fractions we
used in all further experiments. (*Ber. d. chem. Ges., 1885, 47.*)

                                    J. H. S., JR.

On Acetonylacetone. C. PAAL.

Acetonylacetone may be obtained by heating in a sealed glass tube for $1\frac{1}{2}$ hours to 150–160° 1 pt. of pyrotartaric acid with 5–6 pts. of water.

The tube, on being opened, contains a yellow mass, mixed with a little resinous substance. This mixture is now treated with sodium carbonate, which causes the double ketone to separate and float on top of the sodium carbonate solution. The ketone may be obtained pure by fractioning it twice. This ketone consists of a colorless liquid, of pleasant odor, boiling undecomposed at 187–188° C. It is soluble in all proportions in water, alcohol and ether, but insoluble in $KOH + aq.$ and $Na_2CO_3 + aq.$ H_2SO_4 in the cold, on prolonged action, decomposes it.

<div align="center">Diisonitrosoacetonylacetone.</div>

$$CH_3C=N(OH)CH_2—CH_2—CN(OH)—CH_3.$$
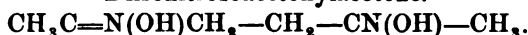
Obtained from the above by treatment with hydroxylamine chloride. Crystallizes in white, prismatic crystals. It is easily soluble in mineral acids, free alkali, hot water, alcohol and ether, but very difficultly soluble in benzole.

<div align="center">Diphenylhydrazinacetonylacetone.</div>

$$CH_3C—CH_2—CH_2—C—CH_3$$
$$C_6H_5N_2H \qquad\qquad N_2H—C_6H_5$$
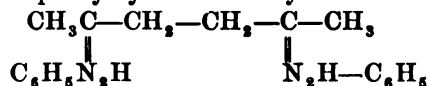
Obtained by heating a mixture of acetonylacetone and phenylhydrazin together. Crystallizes in white, glistening leaflets ; melting point 120° C. It is easily soluble in alcohol, ether and benzole. Nearly insoluble in petroleum ether. (*Ber. d. chem. Ges., 1885, 58.*) J. H. S., JR.

On Mononitro-α-naphthoic Acid. A. E. EKSTRAND.

A concentrated, glacial acetic acid solution of α-naphthoic acid is treated with an excess of fuming nitric acid, heated a few hours on the water bath and allowed to cool. The solution by degrees becomes filled with small needles, which are almost pure mononitro-α-naphthoic acid; M. P. 239°. The filtrate is diluted with water, and the precipitate is digested with soda solution. HCl is now added and throws down an abundant precipitate of nitro-compounds. The precipitate is dissolved in alcohol, and on

cooling, first deposits more of the compound which melt at 239° C., and then, upon concentration, deposits a compound crystallizing in hard prisms, which melt at 215° C. This body is an isomeric nitro-compound. (*Ber. d. chem. Ges.*, *1885*, 73.)   J. H. S., JR.

On the Action of Alcohol on Diazo-Compounds. I. REMSEN.

In reference to the oxidation of nitro metaxylene $C_6H_8 NO_2$ (1) (CH_3) (2) (CH_3) (4), Kuhara and the author obtained the follow-

ing nitrotoluic acid, $C_6H_3 \overset{1}{(NO_2)} \overset{2}{(CH_3)} \overset{4}{COOH}$. On trying by Griess's reaction to convert this body into the corresponding toluic acid, a new acid, differing entirely from metatoluic acid, was obtained. Further investigation showed that this new acid was

$$\text{ethoxymetatoluic acid } C_6H_3 \overset{\displaystyle OC_2H_5 \;(1)}{\underset{\displaystyle COOH \;(4)}{\overset{\displaystyle |}{—CH_3}}} \quad (2)$$
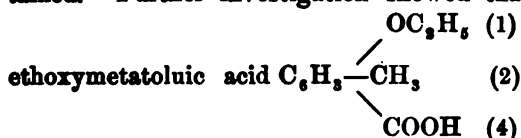
Palmer has recently found that if the diazo-compound of amidotoluenesulphonic acid be boiled with alcohol, it is partly converted into toluenesulphonic acid, and partly into ethoxytoluenesulphonic acid. This divergence from the usual behavior of the diazo-compounds when boiled with alcohol, depends entirely, it is thought, upon atmospheric pressure. Experiments are now in progress to demonstrate this fact. (*Br. d. chem. Ges.*, *1885*, 65.)
        J. H. S., JR.

On the Absorption of Chlorine by Carbon and on its Combination with Hydrogen.   MM. BERTHELOT and GUNTZ.

Melsens has shown that, when wood charcoal previously saturated with chlorine, is exposed to an atmosphere of hydrogen, there is a reduction of temperature. The authors have investigated this paradoxical case and find the result to be due to a simultaneous volatilization of chlorine which is expelled from the charcoal. The condensation of chlorine by charcoal is accompanied by a disengagement of heat much greater than that due to its liquefaction, a result, which is in accordance with the behavior of SO_2, NH_3 and N_2O under similar circumstances. This excess of heat,

however, is only 6.78 Cal. for an atomic wt. of chlorine in grammes while the heat of formation of HCl is $+22.0$. Analysis of the products of the experiment in a given case indicates that seven times as much chlorine is disengaged in the free state as is combined with hydrogen. Calorimetric experiments indicated a cooling effect of $—32.4$ Cal. for each atom of chlorine absorbed. e. g. $+22.0—6.8 =15.2$, and $—(7\times6.8)+15.2= —32.4$. The result, as in all cases of endothermic reaction, is due therefore not to a true chemical reaction, but to the intervention or a foreign energy which in this case is quite independent of the reaction. (*Bul. Soc. Chem.*, **43,** *259*.)   A. A. B.

ANALYTICAL CHEMISTRY.

Determination of Mixtures of Milk Sugar and Cane Sugar. A. W. STOKES and R. BODMER.

A volumetric, method especially applicable to condensed milk. Pavy's ammoniated cupric solution is used, viz.: Cupric sulphate (crystallized), 34.64 grms.; Rochelle salt, 170 grms.; caustic potash, 170 grms., made up to a litre.   120 c. c. of this solution are added to 400 c. c. of ammonia (Sp. Gr. .880) and made up to a litre.   10 c. c. of this solution equals .005 grm. glucose.

The milk or other solution is diluted so that 6–12 c. c. decolorize 40 c. c. of the blue liquid, and run from a burette into a 100 c. c. flask containing 40 c. c. of the cupric solution, previously boiled. A second trial is made with .2 c. c. less of the sugar solution, and the result is thus proven correct to .1 c. c.   Another portion of the sugar solution is then boiled for ten minutes with a 2 per cent. solution of citric acid, by which all cane sugar is inverted while milk sugar remains unaffected, even after 30 minutes' boiling.   The boiled liquid is cooled, neutralized with ammonia and titrated as before.   The two results permit the determination of milk sugar by difference.   The authors have found that milk sugar has 52 per cent. of the reducing power of glucose upon the cupric solution. The process is rapid and accurate, the end reached is sharply marked and the cupric solution will retain its standard value for an indefinite time.   (*The Analyst, April, 1885.*)   A. A. B.

Some Laboratory Apparatus. H. LANDOLT.

The following apparatus is described :

1. Combination of a water-bath and hot-water funnel.
2. Apparatus for the concentration of very dilute solutions.
3. Device for subliming. (*Ber. d. chem. Ges.*, *1885, 56.*)

J. H. S., JR.

Soldering and Repairing Platinum Vessels. J. W. PRATT.

The author uses auric chloride in powder instead of metallic gold for soldering platinum surfaces. Practical suggestions and directions are given for repair and construction of plantinum apparatus used in the laboratory. (*Chem. News*, 51, *181.*) A. A. B.

Abstracts of American Patents Relating to Chemistry.

(*From the Official Gazette of the U. S. Patent Office.*)

April 28th, 1885.

316,451.—Process of manufacturing carbonated malt beverages.—C. H. Frings.

316,457.—Hard rubber filtering case.—E. K. Haynes.

Consists of a case or shell of hard rubber, containing suitable filtering material.

316,465.—Method of purifying and odorizing natural gas.—J. Kountz.

The gas is first passed through lime and water, then through sulphuric acid, and finally brought into contact with asafœtida.

316,471.—Manufacture of derivatives of aurine.—C. Lowe.

316,520.—Gas generator.—J. Bowes.

316,580.—Composition for fuel.—C. H. Sternberg.

Consists of rosin, asphaltum, coal slack, powdered coal, or ground cinders, soot, powdered dry manure, sawdust, wood shavings or ground corn cobs.

316,609.—Composition for purifying gas.—J. Duke.

Consists of monocalcic phosphate calicum sulphate and charcoal or pulverized peat.

316,663.—Refining oils.—A. Rock.

Mineral and vegetable oils are treated with lime or other alkaline earth or earths, and a body rich in oxygen, such as chromic acid, chromates, manganates, etc.

316,708.—Lubricating compound.—D. D. Wass.

A mixture of paraffine, mineral oil, talc and alcohol.

316,723.—Furnace for roasting copper and other ores.—C. A. Bartsch.

316,794.—Apparatus for distilling wood.—E. Koch.

316,799.—Condiment.—R. F. Maier.

A compound table salt consisting of sodium chloride, hypophosphite and sulphate, potassium chloride, and calcium hypophosphite.

316,824.—Ice machine.—T. L. Rankin.

316,863.—Method of generating carbonic acid gas.—C. E. Avery.

Carponic acid is generated by the reaction of the alkaline bicarbonates with calcium sulphate, in presence of water.

May 5th, 1885.

816,961.—Apparatus for creosoting wood.—L. Hansen and A. Smith.

The logs are dried by steam in a closed cylinder, and impregnated with creosote by pressure.

316,964.—Roofing compound.—II. C. Hawes and J. E. Green.

A mixture of red lead and ground iron ore with coal tar, hydraulic cement rosin, gypsum and alum.

317,010.—Phosphate fertilizer.—W. S. Pierce.

The insoluble phosphates of iron, alumina, lime, and other bases are dried and pulverized, mixed with ammonium sulphate and the mixture treated with strong sulphuric acid ; the resulting product is then dried.

317,060.—Apparatus for extracting paraffine from oils.—R. A. William: and J. Bragg.

317,129.—Process of preserving wood.—L. Hansen and A. Smith.

The surface of the wood is first charred, and then the wood is saturated with wood creosote.

317,135.—Retort.—D. Jarves.

317,152.—Chemical fire extinguisher.—E. H. Lewis.

317,197.—Apparatus for manufacturing gas from wood.—G. Ramsdell.

317,206.—Battery fluid.—I. L. Roberts.

Consists of an aqueous solution of potassium permanganate and an alkaline salt.

317,229.—Salt evaporating pan.—G. II. Smith.

317,245.—Apparatus for the separation of gold from its ore by electrochlorination and deposition.—E. P. Thompson.

317,246.—Apparatus for the electro-deposition of gold from its chlorides. —E. P. Thompson.

317,406.—Process of manufacturing gas for illuminating and heating purposes.—J. W. Mitchell.

Carbonic oxide gas is generated by forcing air through ignited fuel, and a gas rich in carbon is generated, separately by injecting a hydrocarbon and su. perheated steam into a heated retort. The two gases are then brought together at a temperature not exceeding 1,600°.

817,407.—Apparatus for generating illuminating and heating gas.—J. W. Mitchell.

317,423.—Apparatus for manufacturing gas.—R. B. Stapp.

Fuel is burned in the firepot for heating the oil gas generating retorts, and part of the carbonic oxide from the fuel is drawn off by a pump and forced into the gas holder. When the retorts are sufficiently heated, carbonic oxide is shut off from the holder and oil admitted to the retorts. The resulting hydrocarbon gas is drawn from the retorts and forced by the pump to the holder, where it is mixed with the carbonic oxide.

317,440. —Process of preserving wood.—J. P. Card.

Wood is treated with deodorized oil and a solution of an antiseptic.

317,444.—Apparatus for burning volatilizable hydrocarbons.—H. de Bay and C. de Rossetti.

May 12th, 1885.

317,490.—Composition for lubricating metallic Surfaces.—H. W. Belknap.

Consists of petroleum, graphite, paraffine wax, tallow and sulphur.

317,581.—Apparatus for manufacturing illuminating gas.—Silas C. Salisbury.

Steam is superheated, reheated, and dried, and then decomposed in contact with heated metal scrap. The resulting hot liberated gas is combined with hot vapors of hydrocarbons, and by means of a mixing injector the hydrocarbon vapors are forced into the rear end of the fixing retort, in which they are fixed and perfected by passage, forward through perforated partitions provided with tubes.

317,587.—Vulcanization of rubber coverings for electrical conductors.—J. J. C. Smith and M. Smith.

The covered wire is enveloped in a tight and impervious cover of tin foil. or other pliable metal and subjected to the simultaneous action of heat and pressure.

317,611.—Apparatus for the manufacture of vaporous and gaseous fuel and illuminating gas.—R. B. Avery.

317,673.—Process of preserving food.—A. G. T. Ripberger.

Provisions are protected against the intrusion of vegetable or animal organisms, by storing them, without the hermetical exclusion of air, in receptacles lined with a filtering medium—such as cotton wool—impregnated with a bitter substance and salt.

317,686.—Gas carburetor.—H. Symons.

317,730.—Method of preserving wood.—E. Z. Collings.

The wood is steamed, dried and impregnated with a preservative.

317,796.—Chlorine gas washer.—J. A. Just.

317,821.—Baking Powder.—A. McDonald.

Consists of potassium or sodium bisulphate and sodium or of potassium, carbonate, or of bicarbonate.

317,823.—Apparatus for generating carbon dioxide.—J. McEwen.

317,953.—Apparatus for manufacturing gas.—Q. F. Randall.

May 19, 1885.

317,975.—Adjustable apparatus for gas machines and mixers.—J. P. Clifford.

318,043.—Manufacture of composite pavement.—J. P. Scott.

Consists of a mixture of broken natural hydraulic limestone, and Portland or other natural cement.

318,044.—Process of grinding caustic soda.—C. Semper.

Ground salt, salt cake or dry sulphate of soda is added to the broken caustic soda, and the mixture is ground and bolted.

318,067.—Process of deoxidizing molten iron in the manufacture of steel.—N. B. Wittman.

In the Bessemer process, free silica is used for eliminating the oxide of iron at, or about the end of the blowing operation.

318,106.—Gas generating apparatus.—A. O. Granger.

Hydrocarbon oil is forced through a coil, in a steam heated chamber, and thence in the form of a fine spray or vapor into the fixing chamber to carburet the water gas.

318,161.—Oxygen gas attachment for gas burners.—C. Beseler.

318,191.—Apparatus for extracting oil from cotton seed.—G. Leder.

318,807.—Method of preparing and treating starch.—J. C. Schuman.

The corn is steeped in water, after which the hulls and germs are detached from the starchy portion by whipping or beating without additional water. The starch meal is then separated from the hulls and germs by sifting, reduced to a liquid with water and mashed.

318,308.—Manufacture of starch.—J. C. Schuman.

318,309.—Manufacture of grape sugar and glucose.—J. C. Schuman.

318,818.—Process of manufacturing gas.—R. B. Stapp.

318,867.—Glue.—R. Gahler.

Ordinary glue is treated with nitric acid and zinc oxide, and steamed until melted. Greasy impurities are skimmed from the surface, and nitric acid added.

318,871.—Fertilizer.—L. Hass.

May 26th, 1885.

318,458.—India rubber gas proof tubing.—T. F. Warrington.

Consists of an inner and outer coating of vulcanized rubber, and an interposed layer of metal foil.

318,484.—Manufacture of the derivatives of aurin.—C. Lowe.

318,496.—Coke oven.—H. M. Pierce.

318,497.—Process of manufacturing coke.—H. M. Pierce.

The coke oven is filled with an initial charge, which is coked by downward progression. When the coking is nearly completed a further charge is added, and so on until the oven is filled.

318,502 & 318,503.—Oil and lard rendering tank.—H. Rall.

318,548.—Process of malting, brewing, etc.—R. D'Heureuse.

The water used is first treated by blowing air through it.

318,551.—Process of making wrought iron direct from iron ores.—C. J. Eames.

The ore is reduced upon a friable graphitic hearth, composed of plumbago, pulverized firebrick and a carbonaceous, adhesive binder.

318,552.—Process of manufacturing ironsponge, wrought and steely irons directly from the ore.—C. J. Eames.

The ore mixed with lumps of graphitic carbon, is charged on a friable graphitic hearth.

318,553.—Process of manufacturing sponge and wrought iron directly from the ore.—C. J. Eames.

The ore is charged on a graphitic hearth and covered with a layer of lump graphite.

318,554.—Hearth and lining of graphite for metallurgical furnaces.—C. J. Eames.

A hearth for reducing furnaces, consisting of graphitic lumps.

318,603.—Process of separating basic compounds from slags.—G. Deumelandt.

Brief. The basic compounds are oxides, hydroxides and carbonates of lime, magnesia, alumina and iron.

The process consists, first, in treating the pulverized slag with a solution of ammonium salts, and filtering off the dissolved lime, magnesia and manganous oxide; second, in boiling the residue with a solution of ammonium salts and filtering off the dissolved alumina and ferrous oxide ; third, in oxidizing and precipitating the manganous oxide by introducing air into the ammoniacal solution ; fourth, in precipitating the salts of calcium and magnesium by the introduction of carbonic acid ; and finally in oxidizing and precipitating the ferrous oxide by introducing air in the presence of ammonia.

318,630.—Method of making hard sugar from soft sugar.—O. H. Krause.

Cakes of soft sugar, or granulated sugar, are charged with hot white liquor and then immersed in cold white liquor.

318,639.—Transforming soft sugar into hard sugar.—F. O. Matthiessen.

Particles of soft, or granulated sugar, are cemented together by crystallization of white liquor which has been introduced into the interstices between the particles of sugar.

318,640.—Apparatus for cementing granulated sugar into blocks.—F. O. Matthiessen and O. H. Krause.

318,642.—Apparatus for the manufacture of varnish.—S. W. Mayer and P. J. Bungart.

318,682.—Still for concentrating sulphuric acid.—C. A. Bartsch.

318,761.—Explosive hand grenade extinguisher.—A. F. Letson and F. Honezger.

Consists of a glass shell, holding a fire extinguishing liquid and a cork provided with a tube and bulb filled with a charge of gunpowder.

318,791.—Paint.—J. P. Perkins.

Consists of silicate slag, ground in oil.

318,792.—Method of making brick.—J. P. Perkins.

The clay is mixed with oil, preparatory to forming and burning.

818,798.—Art of making certain fermented beverages.—C. Pfandler.

In the manufacture of beer ageing is accelerated by inclosing the beer after having passed through the main fermentation, in a storage vessel, and maintaining in the vessel a rarified atmosphere and abstracting the gaseous products of fermentation as they accumulate:

818,826.—Process of preparing dried blood.—W. G. Strype.

A solution of aluminium sulphate, or alum, is added to the blood after which it is dried.

818,851.—Preservative coating for meats.—C. Bartels.

Consists of dissolved isinglass, or gum, and an aromatic compound obtained from galangal, cubebs, aloes, angelica root, and masterwort, resin and Venice turpentine.

818,888.—Apparatus for washing, bleaching and dyeing fabrics.—J. Farmer.   W. R.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—June 5, 1885.

Dr. J. C. Booth in the chair.

The minutes of the meeting of May 1st were read and approved.

The following papers were read :

A Criticism on Dr. C. A. Doremus' Apparatus for Estimating Urea, by W. H. Greene, M.D.

" In Rebuttal " a reply to the above, by C. A. Doremus, Ph. D.

A Convenient Furnace for Melting Gold and Silver, by J. C. Booth, Ph. D.

The meeting was then adjourned, until Friday, September 18th, 1885.

<div align="right">

C. E. MUNSELL,

Recording Secretary.

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THE WATTS FUND.

In addition to subscriptions reported in this JOURNAL (Vol. VII., No. 3), the following have been received :

Prof. A. B. Prescott	$5 00	W. S. Thompson	$5 00
W. M.	3 00	" Cash "	50
A. H. Elliott	10 00	Prof. W. P. Mason	5 00
C. E. P.	2 00	Dr. W. Simon	5 00
Prof. C. L. Jackson	5 00	Prof. J. W. Langley	3 00
F. W. Devoe & Co.	10 00	I. W. Drummond	5 00
H.	2 00	C. S. McLaughlin	5 00

Also the following from the Washington Chemical Society and its members, through the hands of Prof. F. W. Clarke :

Washington Chemical Soc.	$25 00	Thomas Antisell	$1 00
F. V. Broadbent	1 00	T. M. Chatard	1 00
F. W. Clarke	5 00	Wm. Frear	1 00
E. T. Fristoe	1 00	F. A. Gooch	1 00
A. E. Knorr	1 00	E. Richards	1 00
Thomas Robinson	1 00	W. H. Seaman	1 00
G. L. Spencer	1 00	T. C. Trescot	1 00
Wm. Wheeler	1 00	E. Whitfield	1 00
H. W. Wiley	2 00	Dr. J. H. Kidder	5 00

Total _____ $305

A contribution of $25 has been promised by the Chemical Society of the School of Mines, and other contributions have been more or less definitely promised.

The following extracts are from letters relating to the Fund, received by Dr. Waller :

At a meeting of the Committee of the English Chemical Society for the fund on behalf of the family of the late Mr. Henry Watts, F. R. S., it was resolved, "That the best thanks of the Committee be given to the American subscribers to the Fund, and especially to Dr. E. Waller, of New York, for the steps he has taken in the matter."

THE CHESTNUTS, SUDBURY, HARROW, }
May 26, 1885. }

MY DEAR SIR : Many thanks for yours of the 14th, enclosing order on Baring's for £23, being a further contribution to the Watts fund. I am happy to say that the fund amounts now to about £1950, so that we hope it will reach at least £2000 before it is closed. I must again thank you and your friends for this kind help. I think I omitted to send you a receipt for the first amount of £45. I, therefore, enclose you one for it, as well as for the amount just received. . . . .

I remain, yours truly,

W. H PERKINS.

Dr. E. WALLER.
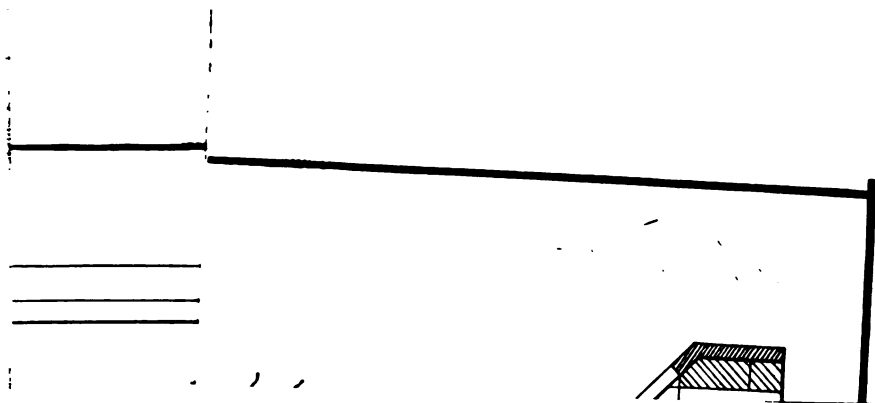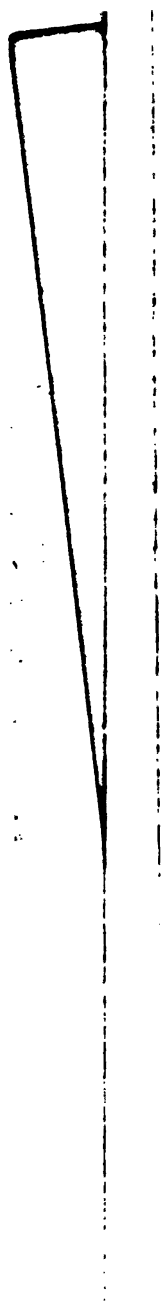
THE SMELTING FURNACE OF THE U. S. MINT.

BY J. C. BOOTH, PH. D.

Its capacity and economy.—The experience of over thirty years in using the gold and silver smelting furnace of the mint at Philadelphia, has gradually led to so many and such thorough alterations in its construction, that nothing remains of the original furnace except the cast iron plales forming the front, sides and top—the mere outside shell, introduced by the late Mr. Franklin Peale, in 1835, the result of his observations and reflections made in Europe on behalf of the U. S. Mint. I can suggest no improvement in the outer form, but confirm Mr. Peale's conclusion of the superiority of the sloping top, which we employ, over the flat top of many European furnaces, because of the greater facility of access offered by the sloping top to the melter in dipping out the liquid metal.

Having carefully studied and modified the interior of this furnace with especial reference to economy of time and fuel in melting—to convenience in melting and casting, and above all, to avoidance of wastage of the precious metals, I deem it desirable to publish drawings of the present furnace, with some details of our mode of working it, for the possible benefit of those interested in works for smelting the precious, or even the commoner metals.

Melting of Steel.—Furnaces for melting steel in crucibles are sometimes sunk beneath the pavement of the melting room, to allow the fullest application of human strength to lift out, by hand, the melting pot, with its heavy contents of melted metal at a bright red or white heat, and pour it rapidly into the molds in a gushing stream, so as to relieve the caster of too long exposure to the intense heat.

Melting Gold and Silver.—Silver and gold are cast at a red heat by dipping up from the pot a few pounds of the melted metal at a time in a small black lead dipping cup, held with tongs, and by carefully pouring it in a small stream into the open gate of the mold, sedulously shunning the loss of a drop by spilling or splashing. A single flashing coruscation is sufficient to alarm the responsible melter for the safety of his account. The heaviest convenient weight to handle and cast safely, is about 120 oz. (over 8 lbs), so that it would require 50 dips to cast out a melt of gold of 6,000 oz. (about 400 lbs.). In like manner

the usual silver melt of 3,600 oz., requires about 40 dips to cast
out all the metal, except the small amount left in the pot to
start the next melting. The frequent dipping and carrying the
dipped metal from the pot to the mold, jealously guarding
against loss, the deliberate pouring of a small stream into the
narrow openings of the mold, the number of pourings required to
discharge one melt, and the necessity of frequently stirring the
residue in the pot during the whole casting, to secure uniformity of
composition and prevent segregation—all these requisites show the
necessity, or great advantage, of having the surface of the metal
to be dipped at the height of about 30 inches from the floor, the
most convenient height for a workman to employ his force with
steadiness, and to continue it for fifteen minutes, the usual time of
casting, with the least fatigue.

The views presented above may prove a sufficient answer to the
question, often asked, why we prefer melting the precious metals
above instead of below the floor of the melting room. One of the
above reasons, the convenience of dipping and ladling, applies
equally well to copper and its alloys, except for large castings.

Risk of Melting Precious Metals by Blast.—A recent improve-
ment in melting metals is the use of gas and a blast of air, whereby
many crucibles are heated at once as in regenerative furnaces, etc.,
whether the fuel be coal, or artificial, or natural gas. The system
seems admirably adapted to steel, and no one thinks of charging
loss of metal to the brilliant sparks of fire that illuminate the
foundry during casting. Who then would dream of loss of steel
in vapor, which has never been seen or heard of? While a single
irregular spark in casting gold or silver might make the melter
tremble for serious loss, great care can prevent it; not so, however,
with the vapor of these metals, which often constitutes a serious
loss to the melter, the more so because entirely invisible. That
this vapor does constantly rise from the surface of these melted
metals in a crucible, over which the draught of the chimney is passing,
is clearly proved by the weight of the metal in the crucible con-
stantly diminishing in direct proportion to the length of exposure
to the melting heat. An exceedingly thin covering of glass, or
even of borax, on the metal in a crucible, diminishes, but does not
prevent, volatilization. The more quiet the movement of air, the
less the volatilization. Hence the object of the smelter should be

to avoid currents of any kind of air or gas moving around the melted precious metals. They should be melted, with their covering fluxes, in a closely covered crucible, as remote as practicable from gaseous currents. Hence my conclusion that the blast to produce heat should not be employed with gold or silver.

Saving Volatilized Metal.—Extreme care to avoid loss has been extended a step further at the U. S. Mint than is done elsewhere, I believe, and I have reason to know that wastage is thereby diminished. When dipping melted metal out of the large crucibles in the fire, we not only keep the surface constantly covered with borax, powdered charcoal, etc., but since that surface is more or less exposed to the draught of air and products of combustion of the fuel escaping up the chimney which are liable to carry up volatilized metal, we take the precaution of closing a damper in the chimney just above the furnace during the whole time of casting, so that any possibly volatilized metal is thrown out and condensed in the air of the melting room, where it settles on the floor and is recovered with the sweepings at the close of each day.

Cast Iron Ash pit.—Since the smelting furnace of the Mint is presented in considerable detail in the accompanying engraving, I shall only draw special attention to parts that seem to require fuller explanation. The furnace consists of the front, sides and top of cast iron plates, bolted to a square cast iron base, as seen in plan and both elevations. The most striking peculiarity is the cast iron ash pit, which I planned and introduced some thirty years since, in place of the fire brick ash pit and hearth, because these became richly charged with gold and silver grains, and required to be broken up and ground several times in the year in order to procure the grains. Now we gather up these grains daily and in a few minutes' time. The form of the ash pit can be gathered from both elevations, and from sections on A B and C D. It is cast on the middle of the base of the furnace, and in one piece with it, as shown in Sec. A B. It is of uniform height on sides and back (see C D and A B), but the front is depressed nearly to the base (A B) making easy access from the front to the space beneath the fire. (*See elevations*). The peculiar curved form of the bottom facilitates the accumulation of ashes toward the front, and their frequent removal by a shovel. Sec. A B shows the back part of the ash pit strengthened by heavier iron at top and bottom, as more fully ex-

hibited in Figs. 1, 2 and 3, the top being liable to burn from expo-
sure to intense heat, and the bottom liable to fracture.

The *Fire Chamber*, built of ordinary fire brick in square form,
as being more readily constructed, and because its corners act
as a reservoir of fuel and heat, stands on a square cast-iron base,
shown in Fig. 4.   Three sides of the square are cast in one piece,
and the fourth side, being liable to burn out first, is a separate
casting and can be replaced without disturbing the rest.   Its posi-
tion is seen in all the large drawings, but best in Sections A B and C
D, where it rests on the top of the ash pit, and just above the grate
bars.   Section C D alone shows the pile of firebricks on their flat
side and flush with the cast-iron base, with large fire slabs of 1½
inches thickness between them and common red brick.   The conve-
nience of this arrangement is that when the fire space is to be re-
newed, the firebricks only are removed and quickly replaced by
new bricks set against the slabs.   Section C D alone exhibits the true
arrangement and dimensions of the fire space and its linings, the
others being a vague, typical representation of brickwork without
dimensions or special aim.   The fourth side of the bed-plate will
last three or four weeks, and when burned out is easily replaced,
the renewal of the whole requiring only part of one day.   The
surface of the fire chamber is picked daily for grains of gold and
silver, and if the virtue of gentle care in this operation were more
in vogue, the life of the lining would probably be doubled in time.
The whole of the cast iron bed-plate is replaced once or twice a
week.   The whole ash-pit enjoys many years of life.

Grate Bars.—While there is nothing peculiar in these bars,
which are given in front elevation, and both sections resting close
together on their two bearing-bars, Fig. 10 and Section A B, the
position of the back bearing-bar is important.   It should be brought
forward an inch or more from touching the back part of the ash-
pit, so that the cooling air passing up behind the bar will insure a
prolongation of life.

Furnace Working-Door.—The sliding-top door of the furnace is
worth noting.   When I first took charge of melting 35 years ago,
this door was a massive, curved slab of iron, of great thickness, as
if designed to keep the heat in and to last forever, and required
considerable force to move it by its heavy handle.   Moreover,
when the furnace was at its high melting heat, the door was also

hot. To economize heat and protect the men I contrived the door represented in Figs. 5, 6, 7, 8, a combination of cast and sheet iron with a fire tile lining and a space between it and the cast iron top for a cooling current of air, so that when the furnace is at almost a white heat, not even redness can be seen, and the door may be touched without burning. Moreover, instead of requiring much force to move it, a boy can slide it on its little railway. (*Front elevation.*)

Since a small part of the cast iron furnace top, just in front of the center of the fire, is liable to be burned out, it is made replaceable. See Plan, Section A B, and Figs. 11 and 13, noting that 13 is inverted. This small piece, detailed in Fig. 11, and in place in Section A B, will last several months and can be replaced in a few minutes.

Having noticed the prominent features of the furnace with special reference to its economy and utility, I merely note, in closing the description, that in our closure of accounts (at least annually) to determine the losses in working the precious metals to the utmost nicety, we make a thorough cleansing of all the apparatus, furnaces, floors, etc., even to chipping the surface of bricks, etc. These pickings, etc., are ground and sifted repeatedly, until reduced to two conditions, one consisting of grains of precious metals, large and small, which are melted into masses, weighed, assayed, and their value credited to the operator, and the other being "sweep" or fine dust, from which we can extract no more gold or silver, and which is sold to sweep smelters at a fair discount from its assayed value.

Recovery of Gold and Silver from Metallic Iron.—There is a third form of residue, the pieces of iron, tools, grate bars, etc., which always have grains of gold and silver on them and in them, and which cannot be ground to powder. How shall we recover the valuable metals from these?

It was answered thirty years since by heating the iron in the fire (oxidizing it), and making it scale off by beating it with hammers; for gold seems to cling to iron with great tenacity. Thus by alternate heating and hammering all the precious metal was obtained, except what rose up in fine powder up the chimney where the iron was heated, and what remained invisible in cracks and holes in the iron itself. Such a gigantic operation required a force

of a dozen men, seated near the furnaces in the melting room;
each with heavy hammers in hand, scaling the hot metal as it came
from the fire, and creating a bewildering din, during three or more
days of ten hours each.

My first improvement of this process was to convert all the
iron into sulphuret of iron, treat it by cold dilute sulphuric acid,
and purify the gold and silver residues before melting. Although
the process was a marked improvement on the noisy nuisance of
the old method, yet it required too long a time and too much space.

My last improvement, which is still practised, consists in the very
simple operation of melting all the iron residues from the furnaces,
even including grate bars, and keeping them in a quiet melted
state, so as to allow the heavier gold and silver to settle out of the
iron. When the mass is cold, the precious metal is knocked off
the bottom by a hammer as a single, tough king with scarcely a
trace of iron in it, while the iron mass above it has never yielded a
race of gold or silver to the assayer. Instead of spending three
weeks of annual vacation from melting, in hammering tons of ac-
cumulated iron, we now melt through the year, whenever conven-
ient, from five to fifty pounds of iron residues at a time. We gath-
ered in one melting last Autumn, a cake of a few ounces of gold
and silver from a mass of over fifty pounds of iron in part of a
day, and the latter was entirely free from the precious metals.
When I first succeeded with this process, I could hardly believe
in the perfect separation from iron, and the late Mr. J. Eckfeldt,
the best assayer in the United States, doubted it, until by numerous
tests made from a piece of some thirty pounds of iron, he found
the total absence of gold and silver.

The question may be asked, Is there not a loss by volatilization
of gold or silver, even if there is a perfect separation from iron?
I can only say that we have found none, but at the same time, I
have not yet made crucial experiments to determine this question.
I will, however, express the opinion that there is none, because the
specific gravity of the two metals carries them rapidly below the
iron without alloying with it.

I will now add but a remark on the execution of this process.
Since much of the iron from such a source is burnt metal, much
oxidized, which therefore obstinately resists melting, or if melted,
is rather too thick and viscid to let the gold through it, the simplest

remedy is to add more iron that is not burned, especially some that is highly carbureted, and to assist fluidity by adding little common salt. I need hardly say that the metal must be kept for hours in the liquid state to allow fully for settling.

It remains to state the amount of gold and silver operated on in the U. S. Mint at Philadelphia, in five or six furnaces for silver and one or two for gold.

Taking the last fiscal year (July 1, 1883, to June 30, 1884) we operated on $26,370,821\frac{45}{100}$ standard ounces of silver ($= 1,808,284\frac{90}{100}$ avoirdupois pounds), and on $764,264\frac{231}{1000}$ standard ounces of gold ($= 52,406\frac{690}{1000}$ avoirdupois pounds).

The value of the silver is approximately the same number of dollars as of ounces. The value of the gold was $\$14,218,869\frac{41}{100}$.

The wastage on the gold was $18\frac{184}{1000}$ st. ozs., equivalent to $\frac{84}{100}$ of the legal allowance, which is $\frac{1}{1000}$ of the whole amount operated on.

During the same period we made 107,527 lbs. of sweep, containing $242\frac{78}{80}$ st. ozs. of gold, and $8,991\frac{71}{100}$ st. oz. of silver. One pound of the general average of sweep contained $\frac{7}{8}$ of one grain of pure gold, and $61\frac{3}{4}$ grains of pure silver.

U. S. MINT, PHILADELPHIA, June 5th, 1885.

SOME REMARKS ON DR. DOREMUS' SIMPLE APPARATUS FOR THE RAPID ESTIMATION OF UREA.

By Wm. H. Greene, M. D.

In this Journal (Vol. VII, page 72), Dr. Charles A. Doremus, describes an apparatus for the estimation of urea which appears to be a modification of an apparatus described by me in the *Comptes Rendus* (Vol. XCVII, page 1141), and represented in the accompanying cut.
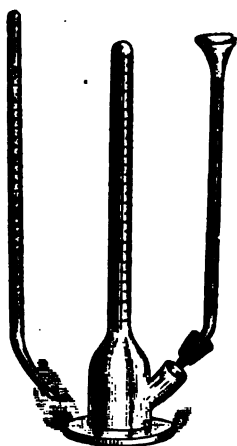
" The general form " of Dr. Doremus' apparatus is not new ; it. is a Cooper's mercurial receiver, known since 1825, with a bulb blown near the mouth. Neither is the graduation of the tube for the direct reading of the proportion of urea new. This graduation, to which I will revert, was first suggested by Russell and West (*Journal of the Chemical Society*, XXVII, page 749), and more recently by A. W. Gerrard in the *Pharmaceutical Journal* (III, 464).

The manipulations with Dr. Doremus' ureometer are not accomplished with greater facility than with that which I suggested, and his instrument requires a special support while mine is provided with a base.

One cubic centimetre of urine frequently evolves so small a volume of gas as greatly to augment the probable error; for this reason I recommended a gravity pipette which permits the introduction of such a quantity of urine as will furnish a fairly readable volume

of gas. This decided advantage seems to have been overlooked by Dr. Doremus.

He also suggests that the bromine and sodium hydroxide solution be mixed in the ureometer, and it has been claimed that this procedure will avoid irritating fumes. I would especially desire that the method of transferring bromine without the production of vapors should be made public.

The proportion of urea in the urine, and even the daily excretion of that compound, are functions of such variable and uncertain factors that a mere knowledge of their quantities can be of but trivial importance to the practitioner of medicine. The centesimal proportion is naturally dependent 'on the volume of the liquid ingesta and on the relative activity of the skin and the kidneys, while the experiments of Lehmann and of Franque have shown the influence of the character of the alimentation on the absolute quantity. In perfect health, the daily excretion may be as low as twenty-five grammes during a vegetable regimen—as high as ninety grammes during an exclusively animal diet. Besides this, the quantity of urea eliminated is intimately related to the muscular activity, and it is not improbable that the diminution in the diurnal exertion of urea which is usually observable during sickness may often be a direct consequence of the coincident muscular repose.

Since, therefore, variations of such magnitude may be expected in health, it is evident that observations made during disease can have but little value unless they be made in series and with great care. A knowledge of the percentage of urea is absolutely worthless; the daily elimination is the only factor that can have significance. Then under similar conditions as to-diet, exercise, and time given to sleep, the comparison of a series of observations may become the source of useful knowledge.

The error which may be introduced into the result of an urea estimation by neglecting corrections for the influence of temperature and pressure on the volume of gas, is uncertain; it may be inappreciable—it may amount to eight per cent. of the whole quantity. An approximation to the proportion of urea may, therefore, be obtained by omitting the calculations which Dr. Doremus states are repugnant to "the average medical man," and assuming that the same quantity of urea always yields the same volume of gas; but how can such an estimation be useful? Assuredly, any

graduation pretending to indicate variations from a supposed *normal percentage* of urea in the urine is based on the unwarranted assumption that the daily emission of urine and urea is constant.

The ability required to make an analysis and to deduce from it correct conclusions is not greater than that necessary for a very simple calculation. There is, however, a method for the estimation of urea which avoids the necessity of any calculation except a single proportion, and which at the same time gives exact results. It is by a second and simultaneous determination of the volume of gas evolved by the decomposition of a known quantity of urea— say one centigramme—in aqueous solution. Supposing that all the nitrogen eliminated from the urine be derived from urea, the quantity in grammes of the latter in the volume of urine employed will be found by dividing one hundredth of the volume of gas obtained from it by the volume obtained from one centigramme of urea. If " the average medical man " possess a thermometer, a barometer, and a table of the tensions of aqueous vapor, he can make the calculation in less time than would be required for the decomposition of the urea solution.

IN REBUTTAL.

By Dr. Charles A. Doremus.

The author of the preceding article has in two letters, one to the editor of a Philadelphia medical journal and another to Professor Austin Flint, Jr., which appeared in the *Medical News* of May 30th, criticised the instrument presented by me before this Society in March. The tone of the first letter was of so uncourteous a character, as it seemed to me, that no response was made to it. On the appearance of an abstract of it in the *Medical Record* of this city, an answer was written at the suggestion of friends, and would have been published had not Prof. Flint informed me of his intention of presenting to the New York County Medical Society, at Dr. Greene's request, the instrument described on the preceding pages.

Dr. Greene's letter to Prof. Flint appears along with a description of the apparatus which accompanied the instrument and some remarks made on the reclamation of priority and the comparative usefulness of the two ureometers. The publication of that article

would, I thought, render any response from me unnecessary, but the foregoing personal criticism rather than that of the instrument, forces from me a reply

To those who heard the reading of my first communication it must seem incredible that so much has been said regarding the origin of the several parts of the ureometer.

My experience in operating with this instrument shows that for the purpose for which it can be legitimately used the volume of nitrogen evolved from a standard solution is remarkably constant. In the experiments that were made to verify the system of graduation a standard 1 per cent. solution of urea was made. The urea was powdered and dried over sulphuric acid for two weeks before weighing.

When Dr. Greene recommends a physician to prepare a standard urea solution for comparative testing he greatly overestimates the physician's ability to procure the urea, and his possession of the necessary apparatus with which to execute the manipulations. Prof. Wormley, in the paper already quoted, says, " During these investigations it was observed that, so long as the conditions remained the same, the relative proportion of the nitrogen eliminated was pretty uniform. Hence if the volume of nitrogen evolved from a known quantity of urea, under certain conditions, or by a given form of apparatus be determined, the result may be taken as the basis for the determination of the urea in the urine with sufficient accuracy for clinical purposes."

What the volume of nitrogen set free actually is, is differently stated by different observers. Huefner, as quoted by Neubauer and Vogel, gives 370 c. c. of nitrogen as being eliminated from 1 grain of urea, the gas measured at 0° C and 760 m. m. barometer. Wormley gives it as 372 c. c.

No stress was laid on any great originality on my part regarding the invention of the apparatus, and, though no exhaustive bibliography was given of the subject, it was certainly my intention to give such credit as would forbid offence to anyone concerned. Dr. Greene, however, states, " In October, 1884, I brought to the notice of the Philadelphia County Medical Society, and described as a modification that might be home-made, the identical tube apparatus, without base, now claimed by Dr. Doremus" (*Medical News*, April 4th, 1885).

As my experiments were begun last year about this time, I can-
not have copied the "identical form" of Dr. Greene's apparatus.
The general form and the method of graduation were given credit
for in the paper presented in March, and there is nothing of great
importance in the fact that the graduation is due to Russell and
West. The facility with which an instrument is manipulated de-
pends so greatly on the "personal equation" that I refrain from
any further reply on these points. Prof. Flint's remarks in his con-
cluding sentences are sufficient upon this point. The ureometer
was purposely made without a base, and it is sold by dealers with
or without as desired.

Dr. Greene seems to have thought of some advantages in that
form of instrument when he devised his home-made apparatus.

I did not " overlook " the advantages that might result from using
5 c. c. of urine instead of one, but made careful experiments and
decided that for the purpose for which the ureometer was intended
there were more reasons for adopting the latter quantity for the
test than the former.

Dr. Greene, in his Medical Chemistry, 1880, p. 110 *et seq*, gives
only two processes for the determination of urea by the hypo-
bromite solution and directs the use of 1 c. c. of urine in each
case.

Prof. T. G. Wormley, in a critical examination of the hypo-
bromite method published in the American *Journal of Medical
Sciences*, July 1881, p. 128, adopts 1 c. c. of standard solution of
urea for his experiments, and recommends the use of that quantity
of urine in the practical examination of urine.

Where larger apparatus can be conveniently used there is cer-
tainly no objection to the use of 5 c. c. of urine, but I tried to
reduce the bulk of the apparatus without diminishing sensibly its
accuracy.

The method of transferring the bromine was described in my
first paper. Unless one desires to be captious, it can safely be said
that in drawing the bromine up in a nipple pipette by relaxing the
nipple that has been compressed before the pipette is introduced
below the level of the bromine and then, by quickly removing the
pipette and squeezing the nipple, expelling the bromine below the
sodium hydrate solution previously poured into the ureometer, "the
bromine is transferred without the production of vapors."

In regard to barometric measurement these same gentlemen state on the same page : "Alterations in the barometer produce so small an alteration in the volume of the gas that it may generally be neglected, e. g., if we have 30 c. c. of nitrogen, the quantity we prefer dealing with, an alteration of 1 inch in the height of the barometer would produce an error in the amount of urea of about 0.003; but for more exact experiments, the correction for pressure should be introduced."

Russell and West give the practical basis for 65 F. and 30 inches barometer at 371, which would correspond with 340.5 at 0° C. and 760 m. m. Greene states it as 354.3 c. c.

I am inclined to agree with Prof. Wormley in his statement that in the apparatus he employed all the nitrogen is evolved, but think that the shaking, possible in the manipulation, causes a slight quantity of gas to be expelled from the hypobromite which is retained in that liquid, whereas, in the instruments under discussion, a much larger volume of reagent is used and there is no agitation.

I decided on adopting Russell and West's graduation only after repeated trials and comparative tests. A strong hypobromite evolves a little more gas than the diluted solution when used in my ureometer, but the gas collects so much more rapidly with the diluted reagent that for practical working I prefer to use it. A decided advantage results if the diluted reagent is employed in that it may be mixed in the ureometer.

Unless chemists agree upon the amount of nitrogen eliminated, under specific conditions, it is useless to attempt to make absolutely correct tests with the hypobromite method. Dr. Greene seems unnecessarily to complicate matters for the physician. If a physician happens to possess a barometer graduated in m. m. (otherwise he must calculate from inches to m. m.) and a centigrade thermometer (or again he must convert F. to C. degrees) he need not have a table of tension of aqueous vapor nor go through the calculation of the

value of 1+0.003665 t., as Dr. Greene proposes, but may use
Dietrich's table, which gives the weight of 1 c. c. of nitrogen for all
temperatures between 10° and 35° C., and barometric pressures from
720 to 770 m. m.   The weight of the nitrogen multiplied by 2.14
gives the weight of urea.

Prof. Witthaus has rendered this table of Dietrich's accessible to
the medical profession by publishing it in his two works on Medical
Chemistry.   Dietrich also gives a table of the absorption of nitro-
gen by the hypobromite, which shows that for 60 c. c. of hypo-
bromite used there is an absorption of 0.53 c. c. of nitrogen when
20 c. c. of that gas are set free.

Dr. Greene does not introduce this factor of absorption by the
hypobromite, which may be greatly influenced by temperature and
pressure in his formula, except in the factor 354.3 which remains
constant, according to him, for all temperatures and pressures.

I fail to comprehend why Dr. Greene should made the following
statement : "At the same time he does not appear to comprehend
the importance of correction for temperature and pressure even in
approximate measurement of gases," in face of the fact that, in my
article read in March before this Society, I state in regard to the
method of Dr. Williams, "The leveling of the water is annoying,
and, though the determination can be made more accurately when
corrections for temperature and pressure are used in the calculation
than with the process to be described, there is, as it is practically
carried out, scarcely any advantage."

In regard to the new form I stated "usually the test is suffi-
ciently accurate to obviate the necessity of reading the temperature
or lowering the ureometer in water to eliminate the error due to
difference in level in the liquid in the two arms of the apparatus.
The instrument is graduated on the practical basis ascertained by
Russell and West for 65 F."

The instrument under discussion is not capable of giving results

so strictly correct that they should be taken, even with all the cor-
rections as the basis, for instance, of a physiological research.
There will always be some escape of nitrogen around the bend
which can only be guessed at. 'This holds good of Dr. Greene's
apparatus. The hypobromite method is not yet capable of such
application, and it is folly to expect accuracy from it. For clini-
cal purposes and the daily examination of urine from patients
undergoing diagnosis or treatment, it is capable of showing fluctua-
tions in the excretion of urea, and any physician using it for such
purposes will doubtless know how to employ it under. similar con-
ditions.

The absolute bodily temperature is rarely ascertained by a
physician, yet clinical thermometers yield valuable information re-
garding the fluctuations in temperature in given cases. That the
object I had in view has not been misunderstood, except perhaps
by Dr. Greene, permit me to quote Prof. Flint's remarks in the
Medical News of May 30th :

Each of the two forms of apparatus is designed to present a con-
venient and rapid application of a well-known method for the quan-
tative determination of urea. There seems to be no ground for
controversy as regards originality or priority ; and practitioners
will undoubtedly select the apparatus which is most con-
venient.

Dr. Doremus presented, by request, at a previous meeting of the
Association, the form of apparatus which he uses in teaching, as
possibly the simplest and most convenient for medical use. The
graduation was made experimentally, at a temperature of 65°
Fahr., with a uniform volume of liquid, so that, these simple con-
ditions being fulfilled, the estimates are sufficiently close for all
practical purposes, and "corrections for temperature and pres-
sure " are unnecessary.

In neither of the two forms of apparatus is there any new
principle involved, and they are to be compared merely from
the point of view of simplicity and convenience of application.

The strictures made by Dr. Greene, accusing Dr. Doremus of
having " acted either ignorantly or with but a slight appreciation
of the ethics of scientific men," seem to me to be uncalled for. The
advantages of both instruments commend themselves on their

simple merits to practitioners, who will, of course, select the one which seems the better adapted to their use. This question I leave to the members of the Association for their decision individually. For myself, I had seen a description of Dr. Greene's apparatus before I made my remarks at a previous meeting; and I simply commended what I conceived to be improvements on all previously described forms of apparatus, without comparing any one form with another.

The Society will, I trust, pardon this lengthy reply to Dr. Greene's criticism when I state that I have endeavored to answer each point he has brought forward and to end what seems to me an uncalled-for discussion.

I will not attempt to discuss Dr. Greene's remarks of a physio-
logical character. They represent to a great extent his individual
opinions, and I decline to prolong this debate by taking up new
issues.

His remarks on the percentage composition are unnecessary, since
the calculation to per cent. was added merely for convenience in
reference, and for those who feel inclined to adopt that method of
comparison.

Most works on urine give the centesimal composition of the urine
though they direct that the calculations be made on quantity
voided in 24 hours.

Tyson in his edition of 1883 says, in regard to the determination
of urea, p. 106, " whence can be calculated either the percentage or
the 24 hours quantity."

Most physicians know that to obtain a just idea of the condition
of the urine the specimen examined should represent a known por-
tion of the entire quantity voided in 24 hours. For all quantitative
estimations a specimen taken from the total voiding should be
analysed. When this is done and the volume of urine is close to
1,500 c. c. or can be diluted to that volume, then the normal mark
on the apparatus gives at least approximate knowledge of the ex-
cretion of urea. It would be absurd to suppose that any guide
could be given that is arbitrary. It is distinctly stated that the
ureometer is graduated for 65° F. This temperature is easily
obtained for the instrument, if necessary, at all times of the year
by placing it for a few minutes in water at that temperature. That
particular temperature was selected by Russell and West as being
that of apartments where the instrument they devised would be
most frequently used. Also because " a fortunate compensation of
errors occurs with this form of apparatus under these circum-
stances. The tension of the aqueous vapour, together with the
expansion of the gas at this temperature, almost exactly counter-
balances the loss of nitrogen in the reaction." (*Journal Chemical
Society*, Vol. 27, p. 751.)

ABSTRACTS.
GENERAL AND INORGANIC CHEMISTRY.

Preparation of Cyanogen in the Wet Way. G. JACQUEMIN.

The usual process, by the action of a concentrated solution of cupric sulphate on a saturated solution of potassium cyanide is incomplete, only half the cyanogen being evolved.

In the process of the author all of the cyanogen of the potassium cyanide is obtained and the gas is pure.

Two parts of cupric sulphate dissolved in four parts of water are placed in a retort or in a balloon, on a water-bath, and, by means of a stoppered funnel, a concentrated solution of one part of pure potassium cyanide is gradually introduced. The reaction begins violently at ordinary temperatures and when the evolution slackens the temperature of the water-bath is elevated to quicken it. 10 grms. of c. p. KCN give 850 c. c. of pure cyanogen. Commercial pure KCN gives the same result, but the gas sometimes contains traces of CO_2.

There are two processes for withdrawing the cyanogen of the copper cyanide. 1. Decant the liquid remaining in the retort or balloon, wash by decantation, and add a slight excess of ferric chloride of 30° B., or higher. The action commences in the cold and a slight elevation of the temperature produces an abundant evolution of cyanogen. The ferric chloride passes to the state of ferrous chloride in transfering the copper cyanide to chloride, which sets free the cyanogen and forms cuprous chloride which turns to cupric chloride at the expense of the excess of persalt of iron. 2. Add to the washed copper cyandide some manganese peroxide and acetic acid. Heat slightly. Acetates of copper and manganese are formed and cyanogen is evolved. When the operation is ended the evolution tube is replaced by a receiver, sulphuric acid is added and the mixture of the two acetates is distilled to collect the acetic acid, which is used again. (*Comptes Rend.*, **100**, *1005*.)   C. E. M.

Ultramarine Blue from Silica (without Alumina) by Use of Heat (I). FR. KNAPP.

The author has attempted to form ultramarine blue from silica, soda and sulphur, according to the formula prescribed by Gmelin,

varying the conditions of the experiment, still without success. The method of Rickman he has also examined. From his experiments he concludes that there is not absolute proof of the impossibility of forming this compound, yet its successful formation is dependent upon a number of conditions not given by and probably unknown to the authors mentioned. (*J. f. prakt. Chem*, 31, *154.*)

F. P. V.

Reagent-bottles. A. GAWALOOSKI.

The new reagent-bottle recommended in this paper is one with a revolving cap having a projecting lip which fits over a spout let into the neck. The reagent is poured altogether from this side-spout. Figures and full explanations will be found in the original article. The advantages are: 1. No volatile reagents can force their way in. 2. No fixing of the stopper by caustic alkalies, &c. 3. Ease of handling and freedom from impurities, as there is no stopper to be removed. (*Zeit. anal. Chem.*, 24, *216.*) F. P. V.

ORGANIC CHEMISTRY.

Chemical Constitution of Isatin. H. KOLBE.

Isatin oxidized by chromic acid yields isatoic acid. This, heated with water, yields carbon dioxide and orthamidobenzoic acid. With hydrochloric acid the chloride is formed. Sulphuric and nitric acids act similarly. Dissolved in alcohol and acted upon by hydrochloric acid gas, ethyl orthamidobenzoic hydrochloride is formed, which is decomposed by water. Isatoic acid with bases in the cold evolved carbon dioxide, so salts could not be formed. Ammonia solution gives ammonium carbonate and orthamidobenzamide. Anilin acts similarly. Concentrated nitric acid gives nitroisatoic acid, which is more stable than nitric acid. This heated with hydrochloric acid or water gives a strong acid resembling metanitro-orthamidobenzoic. Reduction of the nitro-acid with tin and hydrochloric acid gives the hydrochloride of α diamido-benzoic acid. Sulphuric acid gives the sulphate. Treatment of isatoic acid with nitrous acid gives α nitrosalicylic acid. The author concludes that the formula C_4H_4 NCO—COH gives the best explanation of the above facts. (*Journal f. prakt. Chem.*, 30, *467.*) F. P. V.

Isatoic Acid. E. V. Meyer.

This acid has the same composition as anthranilcarboxylic acid and shows similarity in properties. Chromic acid or potassium permanganate causes partial decomposition of isatoic acid with formation of a substance identical with anthranilcarboxylic acid. This may be an isomer then. Ethyl and methyl alcohol acting on isatoic acid yield the ethers of anthranilcarboxylic acid. The action of benzoylchloride, phosphorus pentachloride and acetic anhydride has been studied and the examination of the halogen derivatives begun. (*Jour. prakt. Chem.*, **30**, *484.*)   F. P. V.

Phenyl Cyanate (preliminary notice). Fr. Gumpert.

Hofmann found that phenyl cyanate united direct to urethanes with primary alcohols. Isopropylalcohol gave crystals of the constitution of the phenylcarbaminicisopropyl ether. So with tertiary alcohols. Isatin unites with this body, molecule for molecule, giving a substance melting at 180° C., with decomposition. The chloroform solution of phenyl cyanate was treated with chlorine and also with bromine. The action of phosphorus pentachloride, acetic anhydride, anthranilic acid, benzaldehyde and benzoyl chloride was examined. (*Jour. prakt. Chem.*, **31**, *119.*) F. P. V.

A new Toluylendiamin. E. Lellman.

The above described nitrotoluidin yields on reduction a new diamidotoluol. This reduction was carried out in the usual way with tin and hydrochloric acid. The base melts at 61°–62° and distills at 225°. Several derivatives, toluylenthiourea and diallyltolulvlenthiourea, were formed and analyzed. (*Annalen d. Chemie.*, **228**, *243.*)   F. P. V.

A New Nitrotoluidin. Lellman and Würthner.

Acettoluid is added to a mixture of fuming nitric acid and glacial acetic acid. The resulting nitro- compound is separated by water dissolved in alcohol, boiled with potassium hydroxide and then one-third its volume of water added. Two kinds of crystals are gotten which are separated and purified. One melts at 129°.5, and is metanitroorthotoluidin, the other melts at 158° and is unsaponified nitroacettoluid. The separation of the free nitrotoluidin

is effected by concentrated hydrochloric acid. The melting point then is 97°. Experiments were also made to determine the position of the nitro- group. (*Annalen d. Chemie.*, 228, *239*.) F. P. V.

Constitution of the three Dinitroparaxylols. E. LELL-MAN.

The melting points of these bodies range from 93° to 124°. The constitution was determined by the above tests. In the dinitroparaxylol melting at 93°, the nitro- group was shown to have the ortho- position; in that melting at 124° it was shown to have the meta- position, leaving only the para- position possible for the third. (*Annalen d. Chemie.*, 228, *250*.) F. P. V.

Methods for Determining the Constitution of Aromatic Diamines. E. LELLMAN.

1. Ammonium sulphocyanate is added to a solution of the salt of the diamine; it is then evaporated to dryness, heated an hour at 120°, washed with water and treated with an alkaline lead solution. To this orthodiamines impart no color, meta- and paradiamines give up their sulphur, turning the solution black. 2. A compound is formed in alcoholic solution with 2 mols. of oil of mustard, allyl thiocarbimide, and then melted. If an orthodiamine was used the larger portion of the melt solidifies to a mass of crystals, if a metadiamine the product remains fluid, if a paradiamine it is entirely decomposed. The test first given is used along with this for confirmation. (*Annalen d. Chemie.*, 228, *249*.) F. P. V.

On a New Base found in the Animal Body. A. KOSSEL.

This base was found in the pancreatic gland, and was obtained by the same process which author used previously for the preparation of guanin and hypoxanthin. The larger part of the base is precipitated by ammonia, along with guanin and separated from the latter by means of its chloride. Crystallizes in crystals two centimetres long. (*Ber. d. chem. Gesell.*, *1885*, 79.) J. H. S., Jr.

On Putrefication Bases (Ptomaines) from Fish. O. BOCKLISCH.

Brieger stated in a previous communication that he had found in certain putrefying fish, the following bases : Neuridin $C_5H_{14}N_2$,

Isatoic Acid. E. V. Meyer.

This acid has the same composition as anthranilcarboxylic acid and shows similarity in properties. Chromic acid or potassium permanganate causes partial decomposition of isatoic acid with formation of a substance identical with anthranilcarboxylic acid. This may be an isomer then. Ethyl and methyl alcohol acting on isatoic acid yield the ethers of anthranilcarboxylic acid. The action of benzoylchloride, phosphorus pentachloride and acetic anhydride has been studied and the examination of the halogen derivatives begun. (*Jour. prakt. Chem.*, 30, *484.*)   F. P. V.

Phenyl Cyanate (preliminary notice). Fr. Gumpert.

Hofmann found that phenyl cyanate united direct to urethanes with primary alcohols. Isopropylalcohol gave crystals of the constitution of the phenylcarbaminicisopropyl ether. So with tertiary alcohols. Isatin unites with this body, molecule for molecule, giving a substance melting at 180° C., with decomposition. The chloroform solution of phenyl cyanate was treated with chlorine and also with bromine. The action of phosphorus pentachloride, acetic anhydride, anthranilic acid, benzaldehyde and benzoyl chloride was examined. (*Jour. prakt. Chem.*, 31, *119.*) F. P. V.

A new Toluylendiamin. E. Lellman.

The above described nitrotoluidin yields on reduction a new diamidotoluol. This reduction was carried out in the usual way with tin and hydrochloric acid. The base melts at 61°–62° and distills at 225°. Several derivatives, toluylenthiourea and diallyltolulvlenthiourea, were formed and analyzed. (*Annalen d. Chemie.*, 228, *243.*)   F. P. V.

A New Nitrotoluidin. Lellman and Würthner.

Acettoluid is added to a mixture of fuming nitric acid and glacial acetic acid. The resulting nitro- compound is separated by water dissolved in alcohol, boiled with potassium hydroxide and then one-third its volume of water added. Two kinds of crystals are gotten which are separated and purified. One melts at 129°.5, and is metanitroorthotoluidin, the other melts at 158° and is unsaponified nitroacettoluid. The separation of the free nitrotoluidin

is effected by concentrated hydrochloric acid. The melting point then is 97°. Experiments were also made to determine the position of the nitro- group. (*Annalen d. Chemie.*, 228, *239.*) F. P. V.

Constitution of the three Dinitroparaxylols. E. LELLMAN.

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ethylendiamine, muscarin, and ganidin, $C_7H_{16}NO_2$, and it was the intention of the author to examine other kinds of fish for the same products.   The products of decomposition of fresh-water fish, differ materially from those of salt-water fish.   (*Ber. d. chem. Gesell., 1885*, 86.)   J. H. S., Jr.

On Paraamidooctylbenzene, Paraamidocaprylbenzene and an Amidooctyltoluene.   A. BERAN.

If primary amines of the aromatic series be heated with the alcohols of this series, phenols, and zinc chloride, secondary amines will be formed.   If, on the other hand, alcohols of the fatty series be used under the same circumstances, primary amines, and amines of high molecular weight, also bases in which hydrogen has been replaced by alcoholic radicals, are formed.   From aniline para-compounds are obtained, while o-toluidine yields ortho-compounds.

Paraamidooctylbenzene.
C_8H_{17}, C_6H_4, NH_2
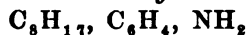
This was obtained by heating a mixture of 7 grms. normal octyl alcohol, 25 grms. aniline-zinc chloride (2 mols. aniline to 1 mol. zinc chloride) for 8 hours to 270–280° C. Boils at 310–311° C. (corr). Is colorless and odorless when freshly distilled, but darkens slowly when exposed to the air.   On cooling it crystallizes in snow white large leaflets, which melt at 19.5° C. Is quite volatile with steam. It was found to be a primary amine.   It forms with acids well characterized salts.

Paraamidocaprylbenzene.
C_8H_{17}, C_6H_4, NH_2
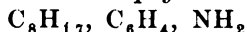
Obtained by heating aniline-zinc chloride with capryl alcohol. It is a colorless, odorless oily fluid which boils at 290–292° (corr.) ; but does not congeal at — 20° C. If heated with chloroform and alcoholic potash it gives the caprylamine reaction.   It forms salts with acids.

Amidooctyltoluene.
$C_8H_{17}, CH_3, C_6H_3, NH_2$
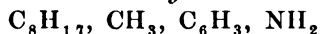
may be obtained by heating 30 grms. o-toluidine-zinc chloride with 8 g. normal octyl alcohol for 7–8 hours at 280° C.   It is, when fresh, colorless and odorless.   Boils at 324–326°, but does not congeal at — 20°.   Yields 45–50% of the weight of the octyl alcohol used.   (*Ber. d. chem. Gesell., 1885*, 131.)   J. H. S., Jr.

β-Hydroxybutyric Acid in Diabetic Urine. DEICHMÜLLER, SZYMANSKI, and TOLLENS.

That this acid occurs in diabetic urine has been observed by several workers of late. The authors have made a more careful and thorough research, however, proving conclusively its existence. Some thirty litres of urine were evaporated to a syrup, neutralized with sodium carbonate and crystallized over sulphuric acid. The crystals were pressed and recrystallized. They are deliquescent. Of the sodium carbonate 8.3 grams were used for neutralization but the crystals were obtained in very small amount. By various reactions and by ultimate analysis they were shown to be β-hydroxy-butyrate of sodium. (*Annalen d. Chem*, **228**, *92*.)   F. P. V.

A Polymeric Dichloracetonitril. A. WEDDIGE and M. KÖRNER.

On conducting dry hydrochloric acid through dichloracetonitril, a crystalline, easily decomposable addition-product is gotten. On heating this several hours at $130°-140°$, in closed tubes, it breaks up into its components and the dichloracetonitril is polymerized. It crystallizes in large prisms, melting at $69°-70°$, is soluble in alcohol, ether and benzol, and, with more difficulty, in water. Trichloracetonitril can be polymerized in the same way. Attempts with the monoacetonitril have not as yet succeeded. (*J. f. prakt. Chem*, **31**, *176*.)   F. P. V.

ANALYTICAL CHEMISTRY.

A New Absorbent for Oxygen. VON DER PFORDTEN.

Heated copper does not entirely free gases from traces of oxygen, and, of course, could not be used to purify sulphuretted hydrogen. The same objections obtain with regard to other ordinary absorbents of oxygen. The author recommends the use of chromous chloride which he prepares by heating chromic acid with concentrated hydrochloric acid, reducing with zinc and hydrochloric acid, precipitating, in absence of air, with sodium acetate and dissolving this precipitate, as needed, in hydrochloric acid. The absorption is thorough, the change of color affords a test for the com-

pletion of the absorption and sulphuretted hydrogen and similar gases have no effect upon it. Nascent hydrogen combines apparently with all oxygen; hence the stream of hydrogen needs no purification. (*Annalen d. Chem*, 228, *112.*)   F. P. V.

Quantitative Separation of Chlorine and Bromine. Emil Berglund.

The method is based on the two facts : first, that a mixture of potassium bisulphate and permanganate sets free all bromine in a solution of bromide and has no action upon chlorides ; second, free bromine can easily be driven out of a solution by means of an air current. This, the author proves by experiments. The presence of bromide lessens the power of chlorides to resist the action of the above mixture, consequently, in the experiments, the duration of air current and strength of solution must both be cared for. Special modifications are necessary where the sample exceeds one gramme. The bromine may be determined by loss or absorbed in a solution of caustic soda and determined. A diagram of absorption apparatus is given. (*Zeit. f. anal. Chem*, 24, *184.*)   F. P. V.

Analysis of Vulcanized Rubber with Especial Regard to the Determination of Sulphur. B. Unger.

Detailed directions are given for the determination of sulphur. Antimony and calcium in vulcanized rubber—the sulphur by fusion of the finely cut sample with copper oxide and sodium carbonate— antimony by fusion with sodium sulphide, and calcium by incineration of sample, solution in hydrochloric acid, separation of antimony with ammonia and determination of calcium as oxalate. The methods yield satisfactory results. (*Zeit. f. anal. Chem*, 24, *167.*)   F. P. V.

Determination of Phosphoric Acid. C. Glaser.

This method depends upon the fact that phosphoric acid, in the presence of calcium compounds, with use of ammonium citrate, is precipitated direct by magnesia mixture, provided that sulphuric acid enough is present to transform all calcium compounds into sulphate and no more citrate is used than is necessary to retain the calcium salts in solution. The magnesia mixture is made up with

magnesium sulphate and the first precipitate is dissolved in dilute sulphuric acid and reprecipitated. (*Zeit. f. anal. Chem,* 24, *178.*) F. P. V.

Remarks upon Mohr's Article on the Determination of Reverted Phosphoric Acid. H. Peterman.

The utility of some of Mohr's suggested improvements in the determination of reverted phosphoric acid (*Zeitschr.* 23, 487,) is discussed, and it is also pointed out that the same suggestions have been made before. (*Zeit. f. anal. Chem,* 24, *175.*)

F. P. V.

Determination of Reverted Phosphoric Acid by the Oxalate Method Compared with the Modification of the Standard Citrate Method. C. Glaser.

Where the phosphates have but a slight percentage of iron, the oxalate and citrate methods yield similar results. In the case of guanos (natural) and iron phosphates a further modification is necessary. (*Zeit. f. anal. Chem,* 24, *181.*) F. P. V.

Remarks upon Mohr's Article on the Determination of Reverted Phosphoric Acid. C. Glaser.

In addition to the remarks of Mohr upon the determination of reverted phosphoric acid, the author points out the needed caution that an abundance of sulphate be present. (*Zeit. f. anal. Chem,* 24, *180.*) F. P. V.

Soap Analysis. A. Gawalooski.

In analysis of soaps where the fatty acids are to be dissolved in petroleum-ether, they must first be dried (consuming many hours) as the moist acids dissolve and filter very slowly. If, however, a few c. c. of absolute alcohol are added, the solution and filtration proceeds rapidly, avoiding all necesssity for drying. (*Zeit. anal. Chem.,* 24, *219.*) F. P. V.

Determination of Nitrogen by the Kjeldahl Method. E. Bosshard.

A table of analyses is given showing the accurate results obtained by this method. Presence of potassium nitrate in the caustic

soda which is distilled over zinc filings must be avoided, however, else ammonia will be formed and carried over in the distillate. Very little zinc and slight excess of caustic soda should be used, as pure caustic soda solution gives, with zinc, a strongly alkaline dis-. tillate. (*Zeit. anal. Chem.*, 24, 199.)   F. P. V.

Detection of Citric Acid. C. MANN.

One grm. of crystallized citric acid and .6–.8 grm. glycerine are melted in a small evaporating dish, heating until a solid porous mass is left. This is made slightly ammoniacal (evaporating off excess of ammonia solution) and, while warm, 1 to 3 drops of fuming nitric acid (5 times diluted) or of an ordinary 8–10 p. c. hydrogen dioxide solution are added. This gives an intense green color. Excess of acid decolorizes. With certain amounts of acid a dark blue is given. Tartaric and malic acids do not give this reaction. (*Zeit. anal. Chem.*, 24, 201.)   F. P. V.

Analytical Operations and Apparatus. II. R. WOLLNY.

Apparatus for distilling, for measuring vapor tension, for main-taining uniform temperature by means of water, for drying in an air current or in vacuum, and for generating gases, are described. For diagrams and descriptions reference must be made to the original article. (*Zeit. anal. Chem.*, 24, 202.)   F. P. V.

Abstracts of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

June 2d, 1885.

318,971.—Absorption ice-machine. C. H. Evans.

318,972.—Process of making ammonium sulphate. E. A. Fales.

The vapor from the distillation of ammoniacal liquor is passed through sulphuric acid, covered with a layer of coal tar.

318,985.—Manufacture of thermometers. J. J. Hicks.

The thermometer tubes, after being filled with mercury, etc., are submitted for a considerable time to a temperature higher than that which they are required to indicate.

319,032.—Chromium mordant. R. Silberberg.

Consists of chromium oxalate, prepared by adding to a solution of potassium bichromate and nitric acid, a solution of oxalic acid in water and glycerine, then boiling the solutions and drawing off the clear liquor.

319,077.—Manufacture of beet sugar. E. F. Dyer.

319,079.—Composition of matter for the preservation of paper or vegetable tubing. Used for the insulation of telegraph wires. J. W. Ellis.

Consists of asphaltum, resin, petroleum, vulcanized rubber and sulphur.

319,082.—Manufacture of saccharine compounds. C. Fahlberg.

The new saccharine compound is toluene-monosulphamid. It is prepared by converting toluene into toluene monosulpho acid, oxidizing this acid or its salts to sulphobenzoic or it salts, then treating the latter with phosphorus pentachloride and ammonium hydrate, or carbonate, and finally separating the pure saccharine from the ammonium salt.

319,084.—Preparation and production of insulating materials. J. A. Fleming.

Consists of vegetable fibre impregnated with a mixture of melted bitumen, the silicates of magnesia, lime, iron and alumina, and amber or other resin.

319,097.—Soap for restoring color to plushes, velvets, etc. A. Kendall.

The soap contains a coloring matter which is imparted to the article to be cleansed when applied.

319,100.—Composition for fireproofing fabrics. F. Konrad.

Consists of a solution of ammonium sulphate, ammonium carbonate, borax, mercuric chloride, peppermint, carbolic acid, sodium bitungstate and chloride of lime, transformed into au emulsion by leading into the solution the products obtained by the distillation of a solution of Peruvian balsam and camphor.

319,108.—Compound liquid for use in the art of refrigeration. J. H. E Mendès.

Consists of sulphurous acid more or less saturated with carbonic acid in solution.

819,111.—Gas meter. W. N. Milsted.

Gas being supplied under constant pressure, quality is indicated by the height of flame.

819,118.—Solution of cuprous chloride, etc., for treating ores. A. Patchen.

Cupric sulphate is heated under pressure with salt, water and metallic copper.

819,125.—Process of working and using asphaltum. J. Rice and A. Steiger.

Pure native asphaltum is softened with hot water or steam and pressed under heated rolls.

819,128.—Lacquer for use in soldering. W. Rosenberg.

Consists of kauri gum, rosin, alcohol and benzine.

819,186.—Process of graining skins. E. Schroeder.

The grain side of the skin is swabbed with a mixture of nitric and muriatic acids.

819,180.—Furnace for preparing artificial fuel. V. Bietrix.

819,289.—Apparatus for making sulphocyanides. U. de Günzberg and J. Pscherniac.

819,270.—Apparatus for cleaning the residuum from zinc retorts. W. Lanyon and R. H. Lanyon.

819,295.—Method of treating vegetable fibre for manufacture of paper pulp. D. Minthorn.

The fibre is treated with a solvent containing hydrofluoric, sulphurous and boracic acid.

819,315.—Manufacture of starch, glucose, etc. P. Radenhausen.

Ammoniacal putrefaction in the starch milk is prevented, and the solid matters precipitated by sulphuric acid.

319,323.—Detergent. C. Robinson.

A detergent for cleaning wall paper, composed of rye flour, wheat flour, corn starch, glue and yeast.

319,364.—Means for detecting and carrying off leakage from gas mains. G. Westinghouse, Jr.

319,365.—Pipe line for gas supply. G. Westinghouse, Jr.

319,409.—Apparatus for bleaching liquids. M. Hanford and C. C. Hanford.

319,434.—Apparatus for generating cold artificially. W. C. Wren.

June 9th, 1885.

319,503.—Obtaining a substitute for albumen from fish roe. J. M. Ordway.

The roe are dissolved in ammonia and precipitated by an acid.

319,604.—Apparatus for manufacturing lampblack. P. Meff.

319,646.—Process of obtaining coloring matter from amidoazoabenzol and homologues. L. Vignon.

A solution of amidoazobenzol hydrochloride, hydrocloric acid and water, heated 140° to 176° F., is reduced by sodium sulphide. After the reduction is complete, the solution is filtered off and oxidized.

319,687.—Process of electrodeposition of copper. M. G. Farmer.

The copper is deposited from a bath of ammonium copper nitrate.

319,806.—Waterproof wood pulp board for roofing. J. F. Fogg.

A combination of wood pulp with a mixture of petroleum, rosin, alum and copperas.

319,854.—Composition for soap. E. Schaal.

June 16th, 1885.

319,951.—Paint. C. E. Brown.

Consists of white glue, dark glue, alum, salt, red iron ore, green bay umber, yellow ochre, and coal tar.

319,956.—Apparatus for the recovery of soda. F. A. Cloudman.

319,971.—Apparatus for distilling glycerin. R. Giebermann.

319,984.—Mixed paint. T. N. Le Ross.

Consists of magnesium sulphate, glue, white lead and oil.

320,002.—Ventilator for gas mains. J. J. Ricketts.

320,009.—Composition for crayons. J. J. Sleeper and H. A. Johns.

Consists of water, kaolin, wheat flour, soapstone and paris-white.

320,060.—Apparatus for mixing aeriform fluids. A. B. Griffen.

320,078.—Gas-making apparatus. T. F. Martin.

320,110.—Apparatus for carbonizing bones, &c. A. Zwillinger.

320,144.—Apparatus for cooling and freezing fluids. A. Kux.

320,256.—Process of making sodium carbonate, A. Kayser.

Sodium sulphate is heated to a low red heat, below its melting point, and a current of carbon dioxide and carbon monoxide is caused to pass through the heated sulphate. Sodium carbonate is formed and sulphur dioxide is given off. The sulphur dioxide generated is used for converting common salt into the sulphate.

320,274.—Oil filter. D. S. Neiman.

320,305.—Cooling and separating a lubricating agent from a compressed gas, and liquefaction of gases and production of refrigeration. J. J. Suckert.

820,806.—Process of liquefying gases and producing refrigeration. J. J. Suckert.

820,807.—Method of and apparatus for purifying and liquefying gases and producing refrigeration. J. J. Suckert.

820,808.—Process of separating and cooling a sealing or lubricating liquid in apparatus for producing refrigeration. J. J. Suckert.

820,809.—Separating and cooling a sealing or lubricating liquid in producing refrigeration. J. J. Suckert.

820,810.—Method of and apparatus for separating a liquefiable gas from a condensable vapor. J. J. Suckert.

820,861.—Method of preparing and treating starch. W. T. Jebb.

A wort, suitable for the manufacture of beer or ale, is produced by steeping corn, and then draining and coarsely crushing or grinding it. The crude starch is separated by sifting and mashed with barley malt.

820,877.—Process of electro depositing nickel. J. A. Mathien.

Brief. Uses nickel proportionate.

820,400.—Manufacture of starch. J. C. Schuman.

Indian corn is steeped, drained and ground, and the starch separated by sifting.

820,401.—Method of preparing and treating starch. J. C. Schuman.

820,402.—Manufacture of starch. J. C. Schuman.

820,403.—Manufacture of grape sugar and glucose. J. C. Schuman.

820,417.—Process of extracting arsenic and mercury contained in the residues obtained in the distillation of mercurial ores. A. Van Straater.

June 23d, 1885.

820,460.—Carburetor. F. Copeland.

Brief. Oil is fed to the carburetor through a measuring valve having a pointer arranged over a graduated plate to indicate the quantity of oil passing through the valve. The carburetor is surrounded by a steam coil, and has a steam heating chamber at the bottom for maintaining the proper temperature.

820,461.—Blow pipe. G. D. Cowen.

820,464.—Varnish. W. E. B. Davies.

Consists of rosin, crude turpentine, naphtha, black oxide of manganese, oxide of lead, umber, essence of bergamot and linseed oil.

820,516.—Glass and other furnaces of the regenerative type. E. Walsh, jr.

820,526.—Process of preparing logwood extract. C. E. Avery.

The logwood liquors or extracts are oxidized, before being mingled with mordants, by the addition of various oxidizing agents.

820,585.—Combined beer and spirit still. D. S. Brown and L. Sipf.

820,588.—Explosive compound. R. S. Penniman.

Consists of nitrate of ammonia, protected from contact with the atmosphere by a coating of petroleum or its products, in combination with chlorate of potash.

820,590.—Process of purifying hyposulphite leaching solutions. E. H. Russell.

After the precious metals have been precipitated from the leaching solution the caustic alkalies are removed by the addition of a soluble salt of iron.

820,608.—Process of tanning. E. S. Ward.

820,627.—Method of coking coal. A. M. Chambers and T. Smith.

820,819.—Process of making refined cast steel and of steel coating wrought iron. T. Sheehan.

Wrought iron is packed in an annealing box, in a compound of charcoal, sodium chloride, sodium bicarbonate, sodium bisulphite, zinc sulphate and broken lime stone.

820,820.—Process of dyeing. R. Silberberg.

820,821.—Mordant. R. Silberberg.

Consists of a mixture of solutions of chromium oxalate and sodium hydrate.

(*June 30th, 1885.*)

820,908.—Smelting ores. M. B. Brett.

820,911.—Apparatus for treating the products of rendering tanks. L. J. Cadwell.

820,921.—Compound for insulating electric wires. R. S. Ferguson, W. Schumacher and W. Tubman.

Consists of pine pitch, rubber, and asbestus, mixed with beeswax, tallow or linseed oil.

821,008.—Ore roasting furnace. W. Brückner.

821,025.—Evaporating apparatus for brine, &c. M. P. Hayes.

821,026.—Neutral sizing material for papermakers' use. R. A. Fischer.

821,092.—Neutral sizing material for papermakers' use. R. A. Fischer.

Consists essentially of a mixture of aluminium and zinc sulphate, free from iron, prepared by neutralizing a solution of aluminium sulphate with zinc oxide, evaporating till the mass becomes viscous, then adding sodium bicarbonate, and breaking up the porous mass after cooling.

821,094.—Manufacture of an aluminous sizing material for papermakers' use. R. A. Fischer.

821,095.—821,098.—Do.

821,109.—Calcimine. K. A. Hohenstein.

Consists of lime, caseine, borax and a soluble gum.

221,120.—Art of manufacturing Portland cement.   R. W. Lesley and D. Griffith.

221,121.—Manufacture of cement.   R. W. Lesley and D. Griffith.

The ground cement is subjected to the action of a current of moist air.

221,124.—Apparatus for the manufacture of gas.   W. F. C. M. McCarty.

221,125.—Process of making gas.   W. F. C. M. McCarty.

Natural gas is subjected to heat, in the presence of steam ; the mixture is then reduced by finely divided iron or other material, after which it is passed through heated carbon, and finally it is superheated.

221,137.—Composition of matter for facing brown stone and for making artificial stone.   B. E. Ratcliffe.

Consists of oil, sand and litharge.

221,161.—Chemical fire extinguisher.   J. A. Wagner.

221,169.—Art of making whiskey.   F. M. Young.

The mash is acidified by the addition of liquid slop, to prevent the subsequent formation of acid, at the expense of the sugar and starch.

221,841.—Process of making sodium sulphite.   E. Carey, H. Gaskell, jr., and F. Hurter.

Salts are exposed to the action of sulphurous acid gas.

221,847.—Manufacture of salt.   J. M Duncan.

221,868.—Disinfecting compound.   F. Jossa.

Consists of calcium sulphate, ferrous sulphate, borax, sodium chloride, sodium bicarbonate and water.

221,410.—Vulcanized soft rubber and process of making same.   F. Wilhöft.

Rubber and sulphur are exposed to a minimum heat of 330° F.

W. R.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—September 18th, 1885.

Dr. A. R. Leeds in the chair.

The minutes of the meeting of June 5th were read and approved. The minutes of the meeting of the Board of Directors of June 12th were read :

The following papers were then presented :

The " Lalande-Spence " Primary Battery, by J. H. Stebbins, Jr.

The Relation of Cocoanut Oil to the various methods of Butter Analysis, by Russell W. Moore, A.B.M.S.

A New Variety of Kobellite, by H. F. and H. A. Keller.

Dr. H. Endemann read a few extracts from a paper on Chinoline Compounds, which will be presented in full at the October meeting.

The names of the following gentlemen were proposed for membership :

Dr. S. E. Simon, Newark, New Jersey.

R. W. Moore, A.B.M.S., 32 West 18th street, New York.

Boverton Redwood, London, England.

Ferdinand Sustersic, Beaumont, Texas.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

THE RELATION OF COCOANUT OIL TO THE VARIOUS METHODS OF BUTTER ANALYSIS.

By Russell W. Moore, A.B., M.S.

The analytical chemistry of the fats is an undeveloped department of science. The various fats have been discovered, their formulæ determined, and their true nature made known ; but analytical processes for separating the various fats and fatty acids from each other with anything like certainty or exactitude, are things for which the student of fatty chemistry is still seeking.

Certain special problems have, however, arisen which have called for an immediate solution, and the stimulus thus given has resulted in a concentration of thought and investigation upon a single question, to which the discovery of many valuable facts is due. A prominent example in this connection can be seen in the case of butter analysis. Various processes were devised, all with the object of distinguishing true butter fat from other fats. The problem was such a difficult one that at one time it was seriously doubted by eminent chemists whether a satisfactory solution could be obtained, since the number of animal and vegetable fats was so great, their character so similar, and their chemistry so little understood.[*]

It is the purpose of this paper to review briefly the various processes which have been used for butter analysis, and at the same time to bring out more fully and completely, than has hitherto been done, the remarkable chemical and physical relations that cocoanut oil bears to true butter fat.

The melting point of the fat was at one time considered a reliable test, as butter fat melts at an average temperature of 35.8° C, while the ordinary substitutes melt at considerably higher temperatures, viz., ox fat, $48^\circ-53^\circ$ C ; mutton fat, $50^\circ-51.6^\circ$.[†]

It is, however, easy to find palatable oils and and fats which, when mixed with that animal product which, for want of a better name, is termed oleomargarine, would bring the fusing point of the mixture within the required limits for butter. There is an additional source of uncertainty in the use of this process, due to the fact that butter fat becomes harder by age, and the melting point rises considerably in consequence.

* Hassall, Food. London, 1876, p. 435.

† Blyth, Foods, etc., p. 294.

In this case cocoanut oil could be mixed with oleomargarine or any other substitute for butter with a higher melting point, since it fuses at a much°lower temperature than even pure butter fat, viz.:

23.5–24.1° (Muter, *Analyst, I., 7.*)
24.2–24.3° (Original observation.)

The specific gravity of the fat has also been used as a test, since butter fat has a higher density, viz.: .91246–.91382 at 37.7°,[*] than what Blyth terms vegetable butterine .90294, or dripping .90659. But cocoanut oil at the same temperature shows a higher specific gravity than pure butter fat, viz.: .9167,[†] .9117.[‡] Allen gives the specific gravity of cocoanut oil at the temperature of 100° C, as .868, and of butter, .865–.868.[§] Thus mixtures of foreign fats could easily be made, of which the specific gravity would be the same as that of butter.

The process of Hehner [‖] was the first one proposed that rested on a purely chemical principle. By this method, as proposed by the author in the original article, the insoluble fatty acids are directly weighed after washing out the soluble fatty acids with boiling water. The limit fixed by Hehner is between 86.5%–87.5% of insoluble fatty acids, while ordinary butter substitutes show much higher figures, in most cases as high as 95%. The investigations of other chemists[¶] have, however, shown that butters are by no means uncommon in which the percentage of insoluble fatty acids will be higher than the limit fixed by Hehner, reaching in some cases as high as 90%.

Cocoanut oil, when examined in strict accordance with Hehner's original directions, yielded 86.43% of insoluble fatty acids,[**] which would thus enable it to be mixed with other fats in such a manner as to escape detection by this process. It is true, however, that the

* Muter, *Analyst, I., 7.*

† R. W. Moore, *American Chem. Journal, VI., No. 6.*

‡ Stillwell, *American Chemist, I., 407* (with correction for temperature as directed).

§ Allen, *Commercial Organic Analysis, II., 136.*

Fresenius, *Zeit. für anal. Chem., XVI., 145.*

¶ Fleischman & Vieth, *Fres. Zeit, 1878, p. 287.* Kretchmar, *Ber. Chem. Gesell., X., 2091.* Kuleschoff, *Wagner's Jahresbericht, 1878, p. 999.* Jehn, *Archiv. d. Pharm., IX., 1878, p. 335.* De la Source, *Ibid, 1882, p. 929.*

** R. W. Moore, *Chem. News, Dec. 5, 1884.*

subsequent modification of Hehner's process by Dupré, * by which the soluble acids are estimated in the washings from the insoluble acids, would probably detect such a mixture by the low percentage of soluble fatty acids found. The low figures by the Hehner process, in the case of cocoanut oil, are in a measure due to the fact that lauric acid, its principal constituent, is volatilized to some extent at the temperature necessary to dry the insoluble fatty acids, and loss is thus occasioned. Nevertheless, cocoanut oil is a more suitable fat for adulteration with a view to escape this method than any other fat hitherto examined.

Another method brought out by Koettstorfer † depends upon the fact that the comparatively high percentage of glycerides of the lower fatty acids in butter causes it to require a greater amount of caustic potash for saponification than other fats. Experiment justified this view in a measure for oleomargarine, and beef and mutton tallow required about 195 m.g. caustic potash per gm. for saponification, while for pure butter fat 223.5–232.5 m.g. were necessary.

Cocoanut oil in this case also refuses to be classed with the ordinary substitutes for butter, and exhibits figures higher even than pure butter, viz.:

‡257.3–258.3
§250.3 246.2‖

These high figures are due to the presence of large amounts of lauric acid, together with smaller quantities of caproic, caprylic and capric acids.

It is thus possible to mix oleomargarine with cocoanut oil in such a manner as to bring the results within the limits set by Koettstorfer. In proof of this the following mixtures were made with the object of approaching nearly the limits of Koettstorfer : **

Cocoanut Oil.	Oleomargarine.	Mgs. K O H per grm.
49.3%	50.7%	220.0
70.2%	29.8%	234.9
Washed Oil.		
53.1%	46.9	223.6
75.9%	24.1	234.9

The oleomargarine used required 193.5 mgs. K O H per grm.

* Analyst, I., 87, 114.
+ Fres. Zeit., XVIII., 199, 431.
‡ Valenta, Dingler's Polyt. Journal, 249, 270.
§ R. W. Moore, Chemical News, Dec. 5th, 1884.
  The oil was thoroughly washed with hot water.
** R. W. Moore, Chemical News, loc. cit.

A general method for testing oils and fats has been brought out by Hübl* and has been recommended by the author as applicable to the examination of butter for foreign fats. It depends upon the relative capacity for absorbing iodine of the formic, oleic and tetrolic series of acids ; the first remaining, under ordinary circumstances, indifferent, while each molecule of the oleic series unites with two atoms of iodine and each molecule of the tetrolic series with four atoms. Thus widely varying figures for various fats and oils are obtained, depending upon the relative amounts of acids of the different series contained in each. Thus, 100 grms. Japanese wax absorb but 4.5 grm. of iodine, while the same quantity of linseed oil, containing 80% linoleic acid, absorbs as high as 160 grms. of iodine.

In this list of iodine figures, butter occupies a place midway between cocoanut oil (8.9 grm.) and the ordinary substitutes. Thus mixtures have been made of oleomargarine and cocoanut oil so as to come within the limits of butter, as the following figures will show.†

Oleomargarine, 55%. } Iodine figure, 35.5.
Cocoanut oil,   45%. }

Lard, 40%. } Iodine figure, 32.2.
Cocoanut oil, 60%. }

In eight samples Hübl found for butter a maximum figure of 35.1, and a minimum of 26.8.

There is, however, a process, the results of which show butter to be an extreme, and cocoanut oil, though considerably in advance of the figures given by the ordinary substitutes for butter, still falls far below the limits set for genuine butter. This method which was brought out by Reichert,‡ consists in distilling off from the sample under examination a definite amount of acid and estimating the same volumetrically. It is by this method that the fact that butter is comparatively rich in butyric acid which is considerably more volatile than any acid contained in cocoanut oil, is brought into prominence, for the distillation, as recommended by the author, is stopped at a point when the less volatile acids come over in any quantity.

* Dingler's *Pol. Journal*, *253*, *281*.
† R. W. Moore, *American Chem. Journ.*, *VI.*, *No. 6*.
‡ *Fres. Zeit.*, *XVIII.*, *63*.

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† R. W. Moore, *American Chem. Journ.*, *VI.*, *No. 6.*
‡ *Fres. Zeit.*, *XVIII.*, *68.*

If the distillation were continued long and the distillate were
freed by filtration from the acid which condenses in a solid forn
the temperature of the condenser, cocoanut oil would give figt
very much higher than those of butter, since it is almost entir
cemposed of acids which can be distilled over with water.[*] In
relative volatility of the more volatile portion of the acids contain
however, butter stands far ahead of cocoanut oil, the prescril
distillate neutralizing, at least, 13. c. c. of $\frac{1}{10}$ normal K O H[†] wl
cocoanut oil, treated in the same manner, requires but 3.7 cb. cr
Thus mixtures of the latter with butter would lower the figu
considerably :

		Hehner.	Koettstorfer.	Hübl.	Reiche
Butter,	50 %.				
Oleomargarine,	27.5%.	89.50	227.5	35.4	8.7
Cocoanut oil,	22.5%.				

Thus it can be seen that cocoanut oil in four processes for testi
butter is characterized by properties which render it, for the chemi
a most dangerous adulterant, making possible a large number
mixtures difficult to detect by chemical methods.   •

The question naturally arises whether cocoanut oil has actua
come into use for this purpose of adulteration, and also whetl
the mixtures contrived to baffle ordinary chemical tests really
semble butter. The first of these questions is most difficult to :
swer, since the process which is capable of detecting such mixtu
has not, by any means, come into general use, and the results (
tained by other processes do not bear upon this question.

There is not, however, a complete absence of evidence on t
point since cocoanut oil is mentioned as an adulterant of lard in t
Analyst (VII., 193), and Dietzsch ‖ makes note of it as a comj
nent of what he terms " Schmalz Butter." The writer also has be
informed by an importer of the oil that it has, to his knowled;
been used, with little success, however, for the purpose of adult
ating both butter and oleomargarine. The mixtures thus produc
were, probably, unpalatable, owing to the fact that the odor of t
oil had not been removed.

* Oudeman's *Journ. für prakt. Chem.*, 81, 367.
† { Reichert, *loc. cit.*
   } Medicus & Scherer, *Fres. Zeit.*, XIX, 159.
‡ { Reichert, *loc. cit.*
   } R. W. Moore, *Chem. News, loc. cit.*
   Nahrungs-mittel und getranke, 4th Ed., p. 212.

It must, however, be taken into consideration that the oil is produced in a warm climate, where decomposition begins easily ; that no means are taken to preserve its freshness, and that when met with in colder countries it is already tolerably old, since the transportation occupies a long time. When first made it is, probably, more agreeable to the taste, for the natives of the countries where it is produced use it for the same purposes as we use butter, and if a demand for a palatable article should arise, it would, probably, be supplied.

The smell and taste of the oil, though disagreeable and unpalatable, can both be removed to a great extent. Careful washing with hot water will accomplish a great deal, and in this way the writer has succeeded in obtaining a tolerably tasteless article. Also, a German patent has been taken out by Jeserich and Meinert* for rendering vegetable oils, including palm and cocoanut oils, inodorous and edible, so that they can be used in place of butter or in combination with it. The process consists in treating the oil with superheated steam and removing any free fatty acid by saponification with a small amount of calcined magnesia, not exceeding 25%. The patentees claim that in this way a perfectly sweet fat is obtained.

Notwithstanding that cocoanut oil might be, and possibly is, a most dangerous adulterant for butter, there yet remains a process by which it can be infallibly detected, if present, in any amount —the process of Reichert. This method is also the surest and most reliable for testing butter for any other foreign fats. It is easy and elegant in use and requires but one standard solution, and that a permanent oil, not liable to daily change like the alcoholic potash solution used in the Koettstorfer process. Only one weighing is required of but ordinary exactitude and the transition point of the final titration is as sharp as could be wished. In fact it is a method possessing many merits and few defects, and it is extremely desirable that it should come into general and extended use. Thus far, it has stood all tests in the hands of many chemists. If, then, cocoanut oil should be the means of casting discredit upon all other methods, and thus of bringing that of Reichert into general use, a great and valuable service would be rendered to the subject of butter analysis.

* *Wagner's Jahresbericht, 1882, 932.*

A NEW VARIETY OF KOBELLITE.*

By H. F. and H. A. Kellar.

In the mines of the Lillian Mining Co. on Printerboy Hill,
Leadville, Col., a mineral consisting essentially of the sulphi(
Pb, Ag and Bi has of late frequently been met with. It occe
nodules of different sizes, attaining occasionally a diameter of se
feet.   They are, as a rule, considerably oxidized into an irre
mixture of Pb SO_4 and $Bi_2 O_3$, leaving often but a black k
in the interior, assaying as high as 9000 and more ounces A;
ton.   The mineral is always found in the lead-bearing streak
mostly near its top against the porphyritic hanging wall.

The undecomposed mineral is of a steel-grey color, finely gra
crystalline, with metallic lustre, and gives a dark grey to l
streak. It is invariably mixed more or less intimately with Pb S
not unfrequently also with Fe S_2 and Zn S.   The first piece cor
under our observation appeared to be just such an intimate mi;
of fine and coarser grains, the latter of which showed the lustre
cubical cleavage of Galenite.   A portion of it was analyzed
no attempt at separating, the result corresponding closely t(
formula 12 (Pb, Ag_2) S. $Bi_2 S_3$.   Further analyses from diff(
portions of the piece convinced us that the above was merel
accidental result, the true silver mineral being of a less basic (
acter.

It is perhaps worth mentioning here, (1) that all samples ;
this piece showed the characteristics of Galenite in that on trea
the finely powdered substance with H N O_3 small portions rema
for a long time unoxidized in the Pb SO_4 formed ; (2) that
an increase of Pb our analyses showed, as expected, a decrea;
Ag, the pure Pb S from the above mines being rather low-grac
respect to Ag.

Through the kindness of Messrs. C. T. Carnahan and H. E. W
of Leadville, we were able to obtain better material for inves·
tion.   Several new pieces of ore which under the lens appeare
portions quite homogeneous were carefully broken, picked, fur

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* See also *Eng. and Min. Journal, Vol. XI., page* 20.

reduced, again picked with the aid of a lens and finally analyzed, with the following results :

	I.	II.	III.
S	15.21	15.27	15.19
Pb	43.94	44.28	44.03
Bi	32.62	33.31	33.89
Ag	5.78	5.49	5.72
Cu	Trace	0.03	Trace
Gangue	0.15	0.14	0.17
	97.70	98.52	99.00

together with traces of Fe and Zn. In our first analysis the Bi is probably too low. The loss in the other two we believe to be due to a slight volatilization of Pb and Bi, caused by reduction of the sulphate and oxide, respectively, adhering to the filter paper, or to an incomplete oxidation of the S.

The formula of the mineral, 3 (Pb, Ag_2) S. $Bi_2 S_3$, would be that of Kobellite [3 Pb S. $(Bi, Sb)_2 S_3$] differing principally from the latter by the absence of Sb. Similar silver—bismuth minerals, also from Colorado, have been described by Drs. F. A. Genth and G. A. Kœnig, of the University of Pennsylvania, under the names of Schirmerite, Cosalite, Alaskaite and Beegerite.

THE "LALANDE-SPENCE" PRIMARY BATTERY.

By James H. Stebbins, Jr.

The following extracts are taken from the description of this battery as given by the owners of the patent :

"The cell is composed of a stamped iron tray, on the bottom of which is sprinkled some oxide of copper. The cell is then half filled with a solution of caustic soda at a certain degree of density, and a plate of zinc is immersed in the solution." * * * * * * *

"There is practically no waste going on in the cell, unless work is being done." * * * "All necessity of removing the zinc plates from the liquid is thus avoided. The action of the caustic soda upon the zinc is entirely uniform ; no honey-combing of the plates takes place." * * "A steady current is given off, and there is practically no polarization, so far as can be ascertained. The electromotive force is very nearly one Volt, and this, combined with the extremely low resistance of each cell, gives a remarkably efficient

rendering." * * * "All the elements can be utilized and us
over again after the electricity has been evolved." * * * "Cau
tic soda having no action whatever upon iron or copper, the cel
which hold the liquid are not attacked in the least. The oxide (
copper merely gives off its oxygen, and is found at the bottom (
the cell in the shape of pure granules of metallic copper, which ca
either be sold at the market price, or, by being placed upon a h(
plate, will in a few moments be once more transformed into oxid
of copper, and this process can be repeated indefinitely. The zin
is, as will be seen above, gradually dissolved by the action of th
caustic soda or potash, and it is held in solution in this liquic
When this solution is drained off and allowed to stand for a fe·
hours, the liquid becomes perfectly clear and transparent. By th
introduction of carbonic acid gas the zinc is at once separated froi
the liquid, which then becomes carbonate of soda, and a precipitat
of beautiful white powder known as oxide of zinc." * * * *

The above description of the "Lalande-Spence" primary batter
having come to the notice of a friend of mine, I was requested b
him to investigate the matter, and see whether what the owners c
the patent claimed could be fully relied upon. I therefore take th
liberty of laying before you the result of my experiments :

RESISTANCE.

The average internal resistance of eight cells measured by
differential galvanometer, bridge and rheostat, was found to b
0.04 Ohms per cell.

ELECTROMOTIVE FORCE.

The E. M. F. was estimated by means of a standard battery (
known E. M. F., a differential galvanometer, bridge and rheosta
according to the formula $C = \dfrac{E}{R} = \dfrac{É}{R}$, and was found to be 0.64 Volt

CURRENT STRENGTH.

A cell was short-circuited through a resistance of 1.5 Ohms f(
twenty-four hours and gave the following measurements :

$$E. M. F. = 0.64 \times 1 = 0.64 \text{ Volts.}$$
$$\text{Inside resistance} = 0.04 \times 1 = 0.04 \text{ Ohms.}$$
$$\text{Rheostat } \text{``} \quad = 1.50 \times 1 = 1.50 \text{ ``}$$
$$\therefore \text{Total } \text{``} \quad = \qquad\quad 1.54 \text{ ``}$$

From which we get $C = \dfrac{E}{R} = \dfrac{0.64}{1.54} = 0.42$ Ampères.

The total quantity of electricity supplied was 36,288 Coulombs in 24 hours. The weight of zinc consumed was 15.456 grms., which gives a theoretical yield of 45,298 Coulombs. This somewhat large difference between the theoretical amount and that actually found, shows that a slight local action was going on. This is a very important matter, as upon it depends the constancy of the battery. I have no doubt, however, but that, by suitable adjustment, this local action may be reduced to a minimum. The total useful available rendering was found to be $\dfrac{0.42 \times 0.64}{9.81} = 0.027$

Kilogram meters per second; equivalent 2334.8 Kg. mtrs. per 24 hours. If from this we deduct the amount of internal work, we get $Q = \dfrac{WK}{9.81} = \dfrac{.04 \times .4096}{9.81} = .001$ Kg. mtrs. per second. This leaves for outside available rendering $.027 - .001 = .026$ Kg. mtrs. per second.—$.001$ Kg. mtrs. per second $= 86.4$ Kg. mtrs. per 24 hours. Therefore the available rendering for outside work per 24 hours is $2334.8 - 86.4 = 2248.4$ Kg. mtrs.

The cost of running (not including plant) for 24 hours amounts to approximately :

Zinc	15.45 grams	@	8c. per lb.	=	0.24 cts.
Copper oxide	19.31 "	@	10c. "	=	0.38 "
Caustic potash	46.35 "	@	8c. "	=	0.74 "
Total					1.36 cts.

In round numbers $1\frac{1}{2}$ cents. This battery is remarkably constant, especially so in the larger sizes, and, provided all local action can be done away with, it ought to last a long while. There is one obstacle in the way of its coming into general use for electric lighting, namely, its comparatively low electromotive force. A large electromotive force is necessary in order to overcome the high resistances of some, in fact most all of the incandescent lamps in the market. This being the case, it will be seen that the Lalande-Spence battery can only be used in connection with lamps of very low resistance, and on decreasing the resistance of a lamp, the illuminating power is diminished likewise. This can, however, be partly overcome by increasing the number of elements in the bat-

tery for a given lamp ; but, for household purposes, where s[
limited, this, I think, would be a most unsatisfactory arrang[
In regard to the recovery of waste products, I do not think t
would pay, unless the system were introduced upon a very
scale, as the labor involved in collecting them would cost mor
could be obtained from the sale of the waste materials.   O
whole I think that the battery is a good one for certain pur
as it is certainly an improvement over most batteries now i[
The larger-sized cells, although giving the same   electron
force, have a much smaller internal resistance, and their con[
is increased largely.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

The Force-function in Crystals. A. EINHORN.

The first part of the paper, which appears at present, restricts itself to the consideration of the Tesseral, Tetragonal, and Rhombic systems.

By means of a well founded assumption in regard to the stress-distribution in crystals of the above systems, the conditions of equilibrium are deduced which further require that the boundary of the configuration shall be either plane or spherical. It also appears that the statical conditions of the agency which causes crystallization are the same as those so well investigated for gravitation and electricity.

The paper is divided into three chapters. The first chapter treats of the " Foundation of the Assumption." The assumption is that the stress upon any particle can only be transmitted in six lines of direction respectively at right angles, in pairs, to the three crystallographic axes. It is a consequence of the internal structure which is shown to be analogous to that of an ordinary pile of cannon balls, by means of the cleavage properties, the external form and the inertia relations of crystals.

The second chapter—" Derivation of the Force Function "—applies the three general differential-equilibrium equations of an elastic solid subject to internal forces, to the stated stress-distribution. In order to effect this it was necessary to deduce some peculiarities of the force-function in a system of uniform density in equilibrium and subject to internal forces when referred to the three principal axes of inertia through the mass centre. The character of the attracting agency here becomes evident.

The third chapter relates to the " Determination of the Boundary." Under this heading the nature of the boundary is determined, and is shown to be either plane or spherical. By the application of Green's theorem it also becomes clear that inasmuch as the statical conditions of the crystallizing agent are now understood, the force-functions derived in the preceding chapter can be independently deduced, without aid of the assumption, from any one of the primitive forms of the systems under consideration.—(*Proc. Royal Soc.,* **38,** *235.*)   THE AUTHOR.

The Oxides of Nitrogen.—W. RAMSAY and J. T. CUNDALL.

An inquiry into the nature of the product obtained by the action of strong nitric acid upon arsenious anhydride. The indigo-blue liquid produced in this case by condensing the resulting fumes is generally supposed to be N_2O_3, and it is stated that it unites with O directly to form N_2O_4.

The authors used nitric acid of 1.5, assisted in some cases by sulphuric acid, dried the vapors by passage through P_2O_5, condensed them in a mixture of ice and hydrochloric acid and collected in weighed bulbs which were then sealed. In the analyses of these products the bulbs were broken in a measuring tube over mercury in presence of sulphuric acid and the resulting NO was measured.

The authors conclude that the liquid contains N_2O_3 mixed with N_2O_4 and NO_2, but that when the water given off by the reaction is absorped by sulphuric acid present in the mixture, no N_2O_3 is formed, but a red liquid containing N_2O_4 and NO_2. N_2O_3 does not exist in the state of gas, being dissociated at moderate temperatures, and pure, liquid N_2O_3, if it exist at all unmixed with the oxides above mentioned, is possible only at very low temperatures. The passage of NO through the red liquid produces N_2O_3 to a limited extent, depending upon temperature. (*Jour. Chem. Soc.*, 269, *187.*)   A. A. B.

On the Clarification of Water by Alum. P. T. AUSTEN and F. WILBUR.

A series of experiments made under the Geological Survey of New Jersey. The quantity of alum used by Jeuner (*Mon. Sci.*, 1865, p. 1007), viz., 04 grm. per litre or 23.3 grms. per U. S. gallon was excessive. The proportion can be reduced to 2—2.5 g. p. g. or ½ oz. to 100 gallons of water. The proportion varies with the water, of course ; the experiments were made with the city water of Brunswick, N. J. No alumina could be detected by ammonia in the filtrate after precipitation. An analysis of the precipitate yielded C 16.50 %, H. 2.02 ; N. 0.77 ; Ash, 59.28, the latter containing much Si. and Al., but little Fe or P_2O_5.

Treatment with alum renders the water easy to filter through paper, etc., which, ordinarily, it is not. Cotton wool is recommended as a filtering medium.

The theory of the precipitation is that Al goes down as basic sulphate, while $K_2 SO_4$ remains in solution. The proportion of alum left in solution, if any, is absolutely harmless. Alum is given medicinally, in doses of 30 grains, four times a day. The question of the removal of the germs of disease by alum will be the subject of a future investigation by the authors. (*Chem. News,* 51, *241.*)

A..A. B.

Action of Sulphur Chloride on Silver Cyanide. R. SCHNEIDER.

Silver chloride is formed by this reaction, together with a mixture of dicyanmonosulphide and dicyantrisulphide which can be most easily separated by careful sublimation. These bodies, the author infers, come from the decomposition of the unstable dicyandisulphide. The trisulphide is colorless, easily changed to a yellow, insoluble modification. It is decomposed by water and alcohol. On distilling in a retort, a yellow powder free from sulphur and having the composition C_9N_{12} is left. This may be looked upon as tricyanuramid $N_3 (CN)_3$. This assumption is supported by experiments conducted by Reed, under the direction of E. v Meyer, which are appended to the above article. (*Jour. prakt. Chem.,* 32, *187.*)   F. P. V.

Sodium Fulminate. A. EHRENBERG.

Fulminating mercury is reduced by sodium amalgam and the resulting liquid allowed to evaporate slowly over quicklime and concentrated sulphuric acid. Bright colorless crystals are gotten, which explode easily when dry. The crystals have the composition $C_2N_2O_2Na + H_2O$. The two molecules are lost by long standing over sulphuric acid. A sodium-mercury fulminate is formed when only half the amount of sodium amalgam necessary for the removal of the mercury is added or by dissolving fulminating mercury in sodium fulminate. By electrolysis the sodium fulminate was decomposed into base and acid, the latter suffering oxidation. Similar products—ammonia, carbonic and hydrocyanic acids—are gotten by oxidation with hydrogen peroxide. (*Jour. prakt. Chem.,* 32, *230.*)   F. P. V.

On the Solubility of Iodine in Fatty Oils. G. GREUL.

The solubility of iodine in fatty oils is comparable in quantity to its solubility in chloroform, ether and carbon disulphide. Heat and trituration assist solution. The solution in castor oil is brown and viscous, and contains 20 per cent. of iodine. Those with olive and almond oils are thinner and brownish red. The castor oil solution is miscible with strong alcohol. (*Archiv. d. Pharm.*, **223**, 431.)

A. A. B.

ORGANIC CHEMISTRY.

On Amidobenzoic Acid Derivatives of Succinic, Sebacylic, and Phthalic Acids. G. PELLIZZARI.

If 10 grms. amidobenzoic acid be heated under return cooler for two days with 20 c. c. succinic acid ether, and 10 c. c. of alcohol, a white crystalline powder is gradually deposited, and the solution still contains an easily crystallizable compound. The solution is evaporated, and the product crystallized from alcohol. The compound least soluble in alcohol separates first in the shape of a white crystalline meal, which melts at about 300° C. with decomposition. On analysis, this compound was found to be succinyldibenzamic acid.

$$C_2H_4 \Big\langle \begin{matrix} CO\ NH\ C_6H_4\ COOH \\ CO\ NH\ C_6H_4\ COOH. \end{matrix}$$
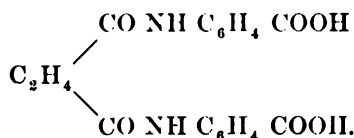
The compound more easily soluble in alcohol was found to be benzamsuccinic acid ether.

$$C_2H_4 \Big\langle \begin{matrix} CO\ NH\ C_6H_4\ COOH \\ CO\ O\ C_2H_5. \end{matrix}$$
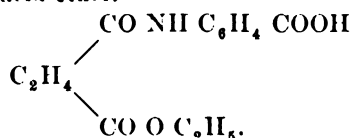
It crystallizes from hot water in lustrous leaflets, melting at 174° C. These treated with ammonia gave two compounds, viz. : benzamsuccinamide and benzamsuccinanilide.

Benzamsuccinic acid ether, on being saponified with barium hy-

drate, splits up as the barium salt decomposed is with HCl, into benzamsuccinic acid, colorless prisms, melting at 222–223° C. On melting, this substance loses 1 mol. of water, and changes into succinylamidobenzoic acid.

Sebacylic acid ether, notwithstanding its larger percentage of carbon, reacts with amidobenzoic acid in the same way as the ethers of the lower homologues. The following two compounds were thus obtained : sebacyldibenzamic acid and benzamsebacylic acid ether.

When phthalic acid ether reacts on amidobenzoic acid, no alcohol should be used as it would interfere with the reaction. From the reaction product benzene separates two crystalline compounds, viz.: phthalamidobenzoic acid and phthalamidobenzoic acid ether.

(*Ber. d. chem. Ges., 1885, 214.*)   J. H. S., Jr.

On the Formation of Sulphons from Alkyl-sulphonated Acids of the Series $C_nH_{2n}O_2$. R. Otto.

If ethylendiphenylsulphon be heated with dilute KOH it is split up into a sulphin salt $(SO_2C_6H_5)$, and a substance which may be taken for phenylsulphonethylalcohol, according to the following reaction :

$$\begin{matrix} CH_2SO_2C_6H_5 \\ | \\ CH_2SO_2C_6H_5 \end{matrix} + KOH = C_6H_5SO_2K + \begin{matrix} CH_2SO_2C_6H_5 \\ | \\ CH_2OH. \end{matrix}$$
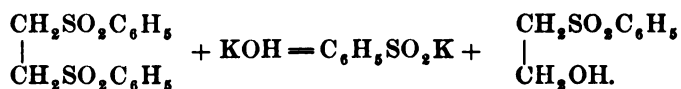
Ethylenchlorhydrin and sodium benzol sulphinate act similarly.

$$\begin{matrix} CH_2Cl \\ | \\ CH_2OH \end{matrix} + C_6H_5SO_2Na = NaCl + \begin{matrix} CH_2SO_2C_6H_5 \\ | \\ CH_2OH. \end{matrix}$$
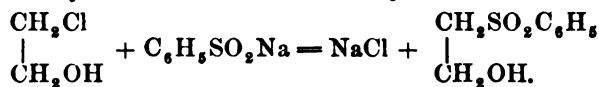
On oxidizing phenylsulphonethylalcohol with a mixture of $K_2Cr_2O_7$ and H_2SO_4, an acid possessing the characteristics of phenylsulphonacetic acid is found, having the formula :

$$\begin{matrix} CH_2SO_2C_6H_5 \\ | \\ COO\ Na. \end{matrix}$$
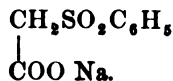
(*Ber. d. chem. Ges., 1885, 154.*)   J. H. S., Jr.

On the Action of Potassium Cyanide on Phthalid. W. Wislicenus.

If equal parts of phthalid and KCN be heated in the oil bath to 180–185° C., the mixture assumes a dark color, and, after three or four hours, the fluid solidifies. When cold, the product dissolves in water, yielding a dark red color. If now enough acid be added to just produce a coloration, in a short time a dark-colored impurity is precipitated, and, on the further addition of acid to the filtered solution, a yellow, semi-crystalline precipitate is thrown down. This precipitate contains N, and possesses the characteristics of an acid. It dissolves in caustic and carbonated alkalies, with a slight evolution of CO_2. It is easily soluble in alcohol, ether, benzene, and chloroform, but is insoluble in water. This acid melts under decomposition at 116° C., and has the constitution $C_9H_7O_2N$. Yield, 95 per cent. of the phthalid used. This compound may be looked upon as benzylcyanide-o-carbo- acid, and is formed according to the following equation :

$$C_6H_4\underset{CO}{\overset{CH_2}{\diagdown\!\diagup}}O + KCN = C_6H_4\underset{COOK.}{\overset{CH_2CN}{\diagdown\!\diagup}}$$

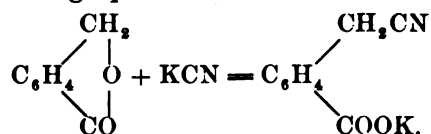On boiling this with an excess of KOH, ammonia is given off, and on acidifying the clear solution, a precipitate of little leaflets (which are soluble in carbonated alkalies) is formed. The precipitate is easily soluble in hot water and alcohol, more difficultly soluble in ether, and insoluble in benzene and chloroform. From the analysis the following formula is derived : $C_9H_8O_4$, etc. (*Ber. d. chem. Ges., 1885, 172.*)   J. II. S., Jr.

Dimethylazobenzol as an Indicator in Alkalimetry. B. Fischer and O. Philipp.

Indicators for the end-reaction of an acid which yield an appearance of color rather than a decoloration are limited, in practice, to the well known ones, litmus and methyl-orange. The latter has the advantage of permitting titration in presence of free CO_2, but its color-change, from orange to pink, is scarcely sharp enough for the color-sense of all analysts. The occurrence also of different chemical substances in trade, under the name of methyl-orange, has led to con-

fusion and dissatisfaction in the use of this indicator. The authors propose the use of the free base, Dimethylamidoazobenzol, $C_6 H_5 - N = N - C_6 H_4 < ^{CH_3}_{CH_3}$ instead of methyl-orange, which is the corresponding sulpho-acid. The base is easily prepared in a state of purity and changes from lemon-yellow to pink in passing from alkaline to acid reaction. To prepare the indicator the authors dissolve 1 mol. of aniline in 2 mols. of HCl (25 per cent.), and to the cooled and dilute solution add 1 mol. of sodium nitrite in water. This solution is poured into a solution of 1 mol. of dimethylanilin in 15 grms. HCl, and after standing, so much sodium acetate (about 30 grms.) is added as will cause it to smell plainly of acetic acid. The resulting crystals are purified by recrystallization from alcohol. In practice an alcoholic solution, 1:200 is used as an indicator. It is entirely unaffected by presence of free CO_2. With HCl it yields even a more brilliant red than with $H_2 SO_4$. Experiments with filter paper saturated with the solution as a substitute for litmus paper was unsatisfactory, but plates of plaster of Paris (Gyps-platen) similarly treated yielded good results.* (*Archiv. d. Pharm.*, **223**, 11–434). A. A. B.

On the Formation of p-Toluyl-p-methylimisatin from Dichloracetic Acid and p-Toluidin. C. Duisberg.

By the action of p-toluidin on dichloracetic acid, P. J. Myer obtained p-toluyl-p-methylimisatin, which he believed to be formed according to the following reaction :

$$2C_7 H_9 N + C_2 H_2 Cl_2 O_2 = C_{16} H_{14} N_2 O + 2HCl + H_2 O + H_2.$$

Led by certain theoretical reasons the author has found that in the above reaction no hydrogen is given off, and, at the same time, he discovered the presence of an intermediate product of the formula $C_{16} H_{16} N_2 O$, which is oxidized by the oxygen of the air into p-toluylen-p-methylimisatin.

p-toluylamido-p-methyloxindol.

Obtained by the action of p-toluidin on dichloracetic acid in the cold, by the following reaction :

$$2C_7 H_7 N + C_2 H_2 Cl_2 O = C_{16} H_{16} N_2 O + 2HCl + H_2.$$
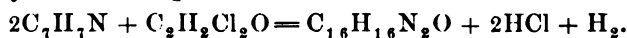
* It is well to remember, in this connection, that calcined plaster generally contains free lime.—B.

Easily soluble in hot alcohol, ether, chloroform, carbon disulphide, and benzene. Less soluble in petroleum, naphtha, and water. Crystallizes from alcohol in small white needles, which melt at 166–167° C.

Diacetyl-p-toluylamido-p-methyloxindol.

In order to determine the number of imide- or hydrol-groups contained in the intermediary compound, it was heated for several hours in a current of hydrogen, with acetic anhydride. The product was crystallized from alcohol, and obtained in the shape of pretty, silken-white needles, which, on analysis, were found to be the above-named compound.

Nitroso-p-toluylamido-p-methyloxindol.

Small light yellow needles, melting at a temperature over 222° C., with decomposition.

Acetyl-p-toluyl-p-methylpseudoimisatin.

Highly red-colored lustrous crystals, which melt at 121–122° C., to a blood red liquid. Insoluble in water and alkalies, but readily soluble in the usual solvents.

Acetyl-p-methylpseudoisatin.

Lemon colored needles, melting at 172° C. Dissolves with difficulty in water; absolute alcohol, ether, carbon disulphide, but easily soluble in chloroform, benzene, etc. (*Ber. d. chem. Ges., 1885, 190.*)   J. H. S., Jr.

Synthesis of Thiophen. V. MEYER.

Thekulé found that on passing the vapor of ethylsulphide through red hot tubes that thiophen was formed. This reaction, as well as others, had been observed by the author but were not made public, as none of them seemed to be satisfactory methods. Notwithstanding this he describes the following experiments.

Dr. A. Calm tried to verify the thiophen formula, by the above reaction,

$$S \diagup^{CH_2-CH_3}_{\diagdown CH_2\ CH_3} = H_6 + S\diagup^{CH=CH}_{\diagdown CH=CH}$$
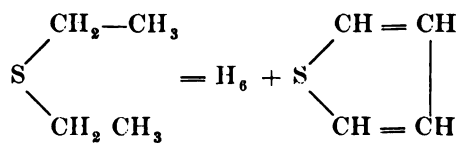
and in fact obtained a fluid which gave the indophenin reaction to

perfection.   Dr. Nahnsen tried a whole series of thiophen syntheses.   At first he passed ethylen or illuminating gas over pyrites. Benzin vapor in lieu of ethylen gave the same result.   More interesting was the action of crotonic acid on phosphorous sulphide.

$$\begin{matrix} CH \\ | \\ CH \\ \| \\ CH \\ | \\ C \end{matrix} \begin{matrix} \fbox{HH} \\ \\ \\ O \end{matrix} \diagdown_{SH} \Bigg/ \quad = H_2O + C_4 H_4 S.$$
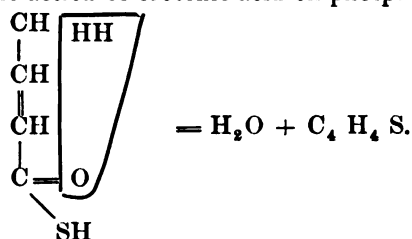
Normal butyric acid behaved in the same manner.

Isobutyric acid treated with phosphorus sulphide acted totally different, giving no trace of thiophen.   Ordinary valerianic acid, treated in the same way, also gave thiophen.

Nahnsen also succeeded in producing thiophen from paraldehyde and ether by heating them with phosphorus sulphide.

(*Ber. d. chem. Ges., 1885, 217.*)   J. H. S., JR.

Oxidation of Oleic Acid by Potassium Permanganate in Alkaline Solution.   A. SOYTZEFF.

The acid obtained by this oxidation melts at 136.5° C., and has the formula $C_{18} H_{36} O_4$.   It is identical with dioxystearic acid, the melting point of which is, by the author's determination, 136.5°—137° C. and not 126° C. as given by Overbeek.   (*Jour. prakt. Chem.*, 31, *541.*)   F. P. V.

Oxidation of Phenol by Means of Nitrobenzol.   M. SIEG-FRIED.

Nitrobenzol is shaken in the cold with a solution of phenol in 24 per cent. sodium hydroxide.   Sodium oxalate is formed, also carbon dioxide.   The nitrobenzol is reduced to azobenzol, and at the same time a resin, soluble in sodium hydroxide, is formed.   (*Jour. prakt. Chem.*, 31, *542.*)   F. P. V.

Cyananiline and some of its Derivatives (preliminary notice).   A. SENF.

Nitrous acid acts upon cyananiline suspended in ether or glacial acetic acid, giving a crystalline compound, $C_{14} H_{15} N_5 O_5$ which,

ANALYTICAL CHEMISTRY.

Test for Chlorides in the presence of Bromides and Iodides. L. DE KONINCK.

Objections are mentioned to the method of testing based upon the formation of chromyl chloride. The following method is recommended. Precipitate the mixed halogens with silver nitrate, digest the precipitate, cold, with 4–5 vols. of a 10–15 per cent. solution of ammonium sesquicarbonate, filter, and add to the filtrate a drop of potassium bromide solution. A precipitate of silver bromide is given if a chloride was present. A slight cloudiness is always seen, but this need not interfere with the test as traces of chloride give a distinct precipitate. If iodates are present they must be reduced to iodides, with sulphurous acid. If cyanides, then the precipitate must be heated until the cyanide is destroyed, the residue reduced with zinc, etc. Sulphur compounds have no effect. (*Zeit. anal. Chem.*, 24, *376*.)   F. P. V.

A New Method of Determining Chlorine Volumetrically. E. BOHLIG.

This method depends upon the great insolubility of silver oxalate, and its almost instantaneous interchange with metallic chlorides in neutral solutions. The solution of the chloride is first boiled a few seconds with basic magnesium carbonate and filtered ; an aliquot part of the filtrate is then taken, and, after cooling, shaken with silver oxalate. After standing, it is filtered, concentrated sulphuric acid is added to half of it, and it is then titrated with chameleon solution. Where organic substances are present the silver oxalate is precipitated with calcium chloride and ammonia and the washed calcium oxalate titrated. (*Zeit. anal. Chem.*, 24, *408*.) F. P. V.

Bottles for Reagents Sensitive to Light. A. GAWALOOSKI.

According to the researches of Jawin and Masson the blue, yellow, brown, or black glass, in ordinary use for this purpose, is incapable of absorbing the chemically active rays. The recommendation is made to use bottles of amber glass, prepared with green, blue, and violet layers, as in flask glass. (*Zeit. anal. Chem.*, 24, *409*.)   F. P. V.

A Quick Method for the Estimation of Phosphoric Acid in Fertilizers.—J. S. WELLS.

A modification of Joule's citric acid process. Two solutions are made, viz.: (*A.*) 1,400 c. c. ammonia of 0.92, 900 grms. citric acid, 500 c. c. water. (*B.*) A strong solution of magnesium citrate. For total acid, 1 grm. of the fertilizer is fused with 3–4 grms. of sodium carbonate and 3–4 grms. of sodium nitrate ; the product is dissolved in nitric acid and to the filtered solution is added so much of solution A that no precipitate shall form, when it is made alkaline with ammonia. After standing half an hour and removal of any silica that may have separated, the solution is precipitated with solution B and the product is washed, dried and weighed. For soluble acid, 1 grm. of the substance is treated with water in the usual way and then precipitated with solution B, after addition of A and excess of ammonia. Insoluble acid is determined in the residue after treating with ammonium citrate in the usual process for extraction of reverted acid by fusion with soda, etc., as in the estimation of total acid. Reverted acid is determined by difference, experience having shown that it can not be accurately estimated in the ammonium citrate solution. Should silica and magnesia occur together, it is best to remove the former in the usual way before proceeding as directed. The results agree fairly with those obtained by the molybdate method. (*J. Chem. Soc.*, 269, *185.*)   A. A. B.

A New Test for Titanic Acid. R. FRESENIUS.

The yellow liquid, obtained by the action of aqueous sulphurous acid on zinc-clippings, or on granulated zinc, is mixed with a solution of titanic acid containing 1.5 m. g. of the acid to 1 c. c. The color is changed immediately to an intense red, becoming reddish yellow, then yellow, and, finally, disappearing. The rapidity of this change depends upon the amount of free acid present. Ether is not colored when shaken with this red liquid. If titanic acid is present in only one-tenth of the above quantity, or less, only a yellow coloring is observed. (*Zeit. anal. Chem.*, 24, *410.*) F. P. V.

Determination of Tin in Tin Slags. R. FRESENIUS and E. HINTZ.

A full scheme of analysis is given for separating tin from the metals commonly occurring with it, viz.: antimony, arsenic, molyb-

denum, tungsten, lead, iron, aluminium, chromium, etc.   (*Zeit. anal. Chem.*, 24, *412.*)   F. P. V.

Toughened Filtered Paper.—E. H. FRANCIS.

Immersion of ordinary filted paper in nitric acid of 1.42 and sub-sequent washing with water, imparts the toughness of parchment paper without greatly impairing the original porosity. The pre-pared paper has ten times the tensile strength of ordinary filter paper, and may be used with the pump without a platinum cone. The paper decreases in size and weight under treatment with acid, and also loses mineral matter. It retains no nitrogen. Filters intended for use with the pump may be conveniently prepared by dipping the apex only in acid.   (*J. Chem. Soc.*, 269, *184.*)   A. A. B.

On the Use of Sulphuric Acid in place of Nitric Acid to Oxidize Sulphides, etc.   E. DIVERS and T. SHIMIDZU.

The advantages of sulphuric acid over nitric acid are that it acts gently so that the acid may all be added at once to the powdered substance ; that no free sulphur is separated ; that many of the metals, *c. g.*, As, Sb, Se, and Te, are ready for immediate treatment without reduction of their oxides ; that the fumes (S O_2 and traces of sulphuric acid) are less objectionable and that there is great economy of time and reagents.   Ferrous sulphate is converted into the corresponding ferrous salt by sulphuric acid.   Mercuric sul-phide (vermilion) is attacked only by boiling sulphuric acid. (*Chem. News*, 51, *193.*)   A. A. B.

Remarks on the Methods of Indigo Testing.   C. RAWSON.

The author maintains that Rau's modification of Fritsche's method (This journal, VI.), yields pure indigotin, but takes no account of indigo red or indirubin.   For estimation of both ingredients he sug-gests the following method: One grm. of indigo, partly ground into a paste with water, is introduced into a 40 oz. flask with 500–600 c. c. of lime water.   The flask has a perforated stopper, carrying funnel, inlet and exit tubes.   A current of H or coal-gas is passed through the flask, and the flask is heated to 80° C ; 200–250° c. c. of a solution of sodium "hyposulphite " * are then introduced and the mixture, which soon takes a yellow tint, is boiled for half an hour.   After

* *Hydrosulphite* prepared by action of zinc upon sodium bisulphite.

the suspended matters have settled, 500 c. c. are withdrawn ;
the remaining liquid is measured. Air is drawn through
500 c. c. for 20 minutes in order to oxidize the hyposulphite ;
indigo white. HCl is then added to dissolve $Ca\,CO_3$ and
precipitate is collected on a weighed filter, dried at 105° C ;
weighed. From the mixture of indigotin and indirubin tl
obtained, the latter is estimated by extraction with alcohol. In
gotin is estimated by difference.

The author also discusses the permanganate method and si
gests modifications which reduce the errors incident to that meth
(*Chem. News*, 51, 255.)   A. A. B

INDUSTRIAL CHEMISTRY.

Recent Results with regard to By-products obtained
Coking Coal in the Simon-Carves Ovens. W. SMITH.

Results previously obtained with these ovens in the hands of
author have shown them to be poor in benzenes and carbolic ac
but very rich in naphthalene and anthracene. Analyses of t
from similar ovens recently erected and worked at somew
higher temperatures and with different coal, show closer
semblance to coal-gas tars, the benzene and carbolic acid be
more abundant. The experience of coal distillers tends towa
the conclusion that increase of benzene follows increased te
peratures, and that the ideal conditions for obtaining a maxim
yield of aromatics are a bright red heat applied externally
a closed vessel containing the coal or other crude material in
thin a layer as possible. The author inclines to the theory of
E. Schulze, namely, that the primary products of the dry disti
tion of coal, obtained at temperatures relatively low, are phen
which split up at higher temperatures, yielding hydrocarbons ;
water. He adds also the suggestion that, in contact with red
carbon, simple reduction of phenols into carbonic oxide and hyc
carbons may occur. The low yield of phenols with excess
paraffines obtained in distilling shale or cannel coal in the Sco
paraffine industry seem to contradict the theory of Schulze, bu
may be in this case that the very low temperatures employed
too low for the production of phenols. Concerning the existe

of Victor Meyer's thiophen in benzenes, the author finds it to vary in proportion to the temperature at which the benzenes are produced. Benzenes obtained from naphthas obtained in the paraffin industry are destitute of thiophen, while those of the Simon-Carves process contain an abundance of it. It may be possible, therefore, by accurate control of the heat, to operate at temperatures which will in great part prevent the product of thiophen. (*Chem. News*, 51, *253.*) A. A. B.

The Illuminating Power of Methane.—L. T. WRIGHT.

Marsh gas was prepared by the process of Gladstone and Tribe, with a slight modification of the apparatus which secured more perfect retention of the vapor of methyliodide. A London argand burner with six inch chimney, and with a metal cap for controlling the air supply, was used. Photometric tests gave 5.2 and 5.15 candles per cubic foot per hour. The flame was slightly yellowish in its luminous portions, and could be made to smoke copiously by limiting the supply of air. Results are given also to illustrate the increased candle power obtained from a given volume of ordinary coal gas when the air supply is properly limited by use of the adjustable cap. (*Jour. Chem. Soc.*, 269, *200.*) A. A. B.

Illuminating Power of Hydrocarbons.—P. F. FRANK-LAND.

In continuation of experiments (the results of which relating to ethylene and benzene have already been published) the author has determined the illuminating power of ethane and propane using as before a " Referee's " burner and calculating the results to a consumption of 5 cubic feet per hour. The results show : That the illuminating power of ethane is 35 candles or half that of ethylene and the illuminating power of propane is 54 candles. In the paraffine series, excluding methane, the illuminating power appears to be proportional to the carbon atoms in the molecule. It remains to be seen whether this law will hold good with the higher members of the series. (*Jour. Chem. Soc.*, 269, *235.*) A. A. B.

Note on Methylene Chloriodide.—J. Sakurai.

In a recent paper the author has referred to this substance
by-product in a reaction which yielded it in quantity too sma
full examination. He now prepares it by a simpler method, viz
the cautious addition of iodine monochloride to methylene io
and subsequent distillation, etc.

It is a yellowish liquid, becoming reddish by exposure to l
Density, 2,444. V.D.= 88.14 ; theory for CH_2 Cl I, 88.24. A1
sis shows Cl, 20.05% ; I, 72.07% ; theory, 20.11 and 71.95.
agreement of these figures with the results previously obt;
confirms the author's views as to the structure of a new seri
organo-metallic bodies, containing methylene, which he has rec
described. (*Jour. Chem. Soc.*, **269**, *198.*)   A. A.

Artificial Asbestos or French Chalk, for packing closing leakages. J. C. Levoir.

For packing in steam boilers, cylinders, stuffing boxes, etc.,
author recommends alternate layers of hemp and absorbent p;
saturated respectively with calcium and magnesium chloride
with sodium silicate. A precipitate is formed on the surfac
contact which effectually fills the pores of the fibrous mat
Asbestos acts as a strong grinding material on all moving p
but a stuffing box filled on the above plan has worked for 1
years without grinding the piston-rod. A mixture of oleic
red lead, quicklime and linseed powder is recommended fo1
screw threads of steam pipes. Packings of the kinds describe1
effective only under pressure, not with a vacuum. (*Chem. J*
51, *217.*)   A. A.

Abstracts of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office).

July 7th, 1885.

321,452.—Bleaching wood pulp and other fibrous material.   G. H. Pond.

The material is bleached by the generation of oxygen in contact with it, in a bath of metallic oxides in water.

321,459.—Artificial stone or marble.   W. H. Stearns, Jr.

Consists of sand or fragmentary stone material and Portland cement, united by cementitious compound, consisting of acetic acid, terra-japonica, manganese borate, carbonate of ammonia, Glaubers salt and balsam.

321,465.—Process of refining petroleum.   J. H. Tiemann.

Directly after the treatment with acid, of the distillates, an anhydrous alkali, alkaline earth, etc., is added to avoid washing.

321,589.—Manufacture of hydraulic cement.   J. Dimelow.

321,636.—Apparatus for drying fusible salts.   R. S. Penniman.

321,661.—Apparatus for the manufacture of carbon bisulphide.   E. R. Taylor.

321,662.—Apparatus for the manufacture of carbon bisulphide.   E. R. Taylor.

321,771.—Apparatus for the manufacture of carbon bisulphide.   E. R. Taylor.

321,868.—Apparatus for manufacturing gas from saw dust.   G. Walker.

Brief.—Wood sawdust is fed to and conveyed through retorts by spiral screw conveyors, and the granular charcoal is conducted from the retorts to a tight movable chamber by a screw conveyor.   The gas resulting from the distillation is conducted to a condenser.

321,870.—Apparatus for washing and scrubbing coal gas.   F. Weck.

321,925.—Process of distilling lactic acid.   C. N. Waite.

Lactic acid is distilled and purified by the aid of free steam.

July 21st, 1885.

322,458.—Apparatus for producing ammoniacal gas.   C. B. Lee.

322,557.—Compound for purifying iron and steel.   W. H. Purdy.

Consists of red lead and cinnabar, with sand and water.

332,608.—Method of and apparatus for generating gas.   C. W. Isbell and W. H. Taylor.

Brief.—Water gas is made, carbureted in the take-off pipe, and fixed in a separate body of incandescent fuel.   Steam is passed up through one body of incandescent fuel, and the resulting products of decomposition down through another body of fuel in the same generator, and the resulting water gas is

carbureted by a volume of oil vapor, which has previously been mad
stored at the time the air blast is entering the fuel, the oil being vaporiz
hot products of combustion brought in contact with a vaporizer in the
off pipe. The carbureted water gas is fixed by passage down through a
rate body of incandescent fuel, which is blown up and heated independ
of the body of fuel, in which gas is generated.

322,782.—Apparatus for the manufacture of white lead. H. G. Blyth.

322,802.—Process of making the compound termed "Kerite." A. G.
The process consists in first mixing together cotton seed oil and coal t
bitumen, and afterward adding linseed oil and sulphide of antimony or (
sulphide, with or without the addition of sulphur.

July 28th, 1885.

322,940.—Manufacture of iodoform, bromoform and chloroform.
Kempf.
The corresponding halogen compounds of the alkalies or alkaline ea
are subjected to electrolysis in the presence of alcohol, aldehyde or ace
with the aid of heat, and with or without the addition of carbonic acid.

322,996.—Manufacture of leathery compound. S. P. M. Tasker.
Fibrous material mixed with gelatine is treated with tannic acid.

323,016.—Waterproof composition for felt, paper, etc. O. Zinreck.
Consists of acetate of alumina, acetate of lead and albumen.

323,222.—Process of extracting gold, silver and copper from their (
J. W. Simpson.
The ore is treated with a solution of potassium cyanide, ammonium
bonate, and sodium chloride, and the metals are precipitated from the re
ing solution.

August 4th, 1885.

323,402.—Compound for waterproofing boots, shoes, etc. J. B. Dupr
Consists of tar, tallow or stearine, beeswax, and turpentine with alum
or salts of alumina.

323,426.—Metallic compound. F. Kavanaugh.
This is a process for making journal bearings by melting zinc, tin, cop
lead and cast iron, with a flux of sal-ammoniac, silica and borax.

323,431.—Apparatus for purification of water. A. R. Leeds.
Water and air, both under pressure, are passed through a closed chan
containing filtering material.

323,499.—Apparatus for the manufacture of white lead. S. D. Cornel

323,514.—Manufacture of methylene blue by electrolysis. W. Massert
Methylene blue and other homologous colors containing sulphur, are
duced from paramido derivatives of primary, secondary and tertiary ami
and from the hydrazo- compounds of the latter by electrolysis in acidul
solution and in the presence of such substances, as under the action of
electric current, separate out sulphur on the positive pole.

823,660.—Process of manufacturing illuminating gas. C. M. Gearing.

The products of combustion of liquid fuel, together with a current of steam, air and a hydrocarbon are simultaneously injected into highly heated retorts.

823,662.—Composition for Bengal lights. C. Gerhard.

Consists of strontium nitrate and chlorate, potassium chlorate, powdered glass and flour, with an alcoholic solution of a resinous substance.

823,680.—Filter bed. E. Holden.

A plate provided with minute tapering holes, having their smaller ends presented to the flow of the liquid.

823,694.—Method of and apparatus for treating semi-liquid substances with purifying or other liquids. E. Langen.

823,754.—Condensed peptonized milk. W. H. Thew.

August 11th, 1885.

823,959.—Process of preparing the charge for spelter furnaces. E. Phillips and T. Jones.

The zinc ore is mixed with lime, or flour and flux, and formed into a cylindrical retort charge having a central longitudinal flue. These cylinders are then placed in zinc retorts and subjected to external heat.

824,018.—Lubricating compound. G. P. French.

Consists of petroleum, sal-soda, potash, borax, cream of tartar, paraffin wax, bay or green wax, unctuous oil and plumbago.

824,048.—Condensing peptonized milk. W. H. Thew.

Milk is heated to about 55° C., and pancreatic liquid is added. The product is then sufficiently heated to destroy the ferment, and condensed.

824,049.—Condensed peptonized milk with cocoa. W. H. Thew.

824,050.—Condensed peptonized milk with coffee. W. H. Thew.

824,103.—Process of making a fertilizer from tank waters. C. Gibson.

The tank waters of slaughter houses, etc., are mixed with an acid sulphate of an alkali, aluminous cake, or aluminium sulphate, and boiled down to expel excess of water. The resulting mass is agitated with a carbonate, oxide or hydrate of an alkali or alkaline earth and ground.

824,112.—Manufacture of beton. H. A. Hudson.

824,137.—Apparatus for continuous bleaching. W. Mather.

824,177.—Carburetor. W. F. Singer.

824,179.—Process of generating hydrogen gas. B. Sloper.

Adds an alkaline carbonate to the acid water, acting upon iron or zinc.

824,200.—Manufacture of white lead. W. H. Wetherill.

The tan bark usually used around the pots in the Dutch method, is replaced by ground or fibrous spent licorice.

824,236.—Mixed paint. R. W. Davis.

Consists of shell marl, oil and oxide of zinc.

August 18th, 1885.

824,471.—Extraction of sodium phosphate from slags.   L. Imperatori
The phosphatic material is smelted with potassium or sodium sulphat
carbon, and the product is treated with carbonic acid.

824,505.—Process of refining or preparing copper for casting.   W
Walton.
Carbon, mixed with the zinc oxide or carbonate, is added on the surfa
the copper as it melts.

824,522.—Process of manufacturing beer or ale.   A. W. Billings.
The process consists in mashing raw grain, to remove the starch wit
extracting the oils, adding diastase, and combining the mash thus made
mash made from malt and treating the two together as usual.

824,528.—Apparatus for the manufacture of beer.   A. W. Billings.

824,560.—Polariscope.   W. G. King.

824,615.—Manufacture of coloring matter from alpha-naphthol and din
naphthol.   L. Vignon.
Alpha-naphthol is treated with sulphuric acid of 66° B, until a liquid
duct is obtained, then pure ice is added to cool and dilute the solution,
which nitric acid of 40° B, is added, the temperature being kept below 3
The solution is then heated to nearly 40° C, then cooled to 12-15° C,
filtered.   The precipitate is redissolved and treated with potassium carbo
in solution, to produce a precipitate, which is pressed and dried.

824,630.—Coloring matter from phenylhydrazine.   H. Ziegler.

824,658.—Electric process of smelting ore, for the production of al
bronzes and metallic compounds.   E. H. Cowles and A. H. Cowles.

824,659.—Process of electric smelting, for obtaining aluminium.   E
Cowles, C. F. Mabery and A. H. Cowles.
Aluminium ore is mixed with broken carbon and a metal.   The ore is
reduced by electricity, so that the aluminium forms an alloy with the m
after which the metals are separated.

824,685.—Apparatus for generating hydrocarbon gas.   J. Hanlon.

824,750.—Filtering paper.   E. W. Cartor.
Loose cut thread or other fibre is mixed in the pulp to strengthen the pa

824,761.—Process of making syrup and beer from maize.   A. E. Fero

824,790.—Process of manufacturing iron or steel.   J. L. Y. Sarda.
The iron is heated to a red or white heat, and immersed in a bath of r
acid and soda, after which it is reheated, remelted, rolled, etc.

August 25th, 1885.

824,809.—Apparatus for generating illuminating gas.   R. Boeklen
J. D. Averell.

824,822.—Process of making beer.   L. Ernst.

324,878.—Rosin oil.   D. J. Ogilvy.
Rosin oil is treated with an alkaline salt of sodium or potassium, to
tralize the resinous acids.

824,903.—Apparatus for converting iron into steel. P. L. Weimer.

325,119.—Method of vulcanizing rubber. F. W. Seabury.

The rubber is subjected to the action of steam under pressure and high heat, in a vulcanizing chamber.

September 8th, 1885.

325,683.—Application of chloride of lime to bleaching purposes. G. Lunge.

The action of the chloride of lime is hastened by the use of acetic or formic acid.

325,766.—Apparatus for generating illuminating gas. R. M. Potter and R. Boeklen.

Brief.—The bed of fuel is raised to a high heat by an air blast, and the fixing chamber at the top of the furnace is heated by the products of combustion. Then the blast of the blower is shut off, fresh gas coal is supplied to the bed of fuel, the exhauster is started, and a small supply of air thereby drawn into the fuel and gas from the generator. A small supply of steam is also admitted to the fuel, and the gases distilled from the coal and resulting from the decomposition of steam and air are enriched with hydrocarbon oil or gas generated in retorts in the furnace walls. The mixture of gas and vapors is converted into a fixed gas in a fixing chamber and in a separate superheater, should the latter be required. A fuel hopper provided with valves, an inclined grate and rakers, and a sealed chamber for ash and spent fuel at the lower end of the grate, provide for charging and cleaning the generator during the manufacture of gas.

325,771.—Apparatus for producing ammonia. C. A. Schneider.

325,827.—Manufacture of violet dye stuffs. F. Fischer.

Diethylaniline is treated with perchlormethylmercaptan.

325,828.—Violet methyl dyestuff. F. Fischer.

326,066.—Process of making hydrates of barium and strontium. W. G. Strype.

A solution of a sulphide of barium or strontium is subjected to the action of currents of air in the presence of an oxide of iron.

September 15th, 1885.

326,088.—Method of rendering cloth, wood, paper, etc., waterproof. N. A. Alexanderson.

The materials are impregnated with a solution of a basic salt of aluminium, prepared by adding an equivalent quantity of the hydrates or carbonates of the alkali, or of the alkaline earths to a neutral salt of aluminium. If necessary, tartaric or citric acid may also be added.

326,220.—Manufacture of compounds of india rubber, gutta percha and like materials. A. H. Huth.

Earth wax and gums, or resins, are fused until all volatile matters are expelled. They are then cooled, pulverized and mixed with indiarubber, etc.

326,221.—Art of purifying water. J. W. Hyatt.

826,281.—Saccharine compound.   C. Fahlberg.

A mixture of starch or grape sugar and benzoic sulfinide.

826,817.—Manufacture of artificial stone or marble.   S. Mixer.

826,423.—Process of purifying ammonia soda.   H. Gaskell, Jr.

The sodium bicarbonate is heated in an atmosphere of carbonic acid expel the ammonia, without decomposing the bicarbonate.

826,467.—Drying oil.   P. A. Wittmack.

A mixture of petroleum, rosin or rosin oil, linseed oil, cotton seed oil binoxide of manganese.

826,479.—Disinfectant.   F. J. Cromwell.

Consists of caustic soda, water, sulphate of iron, gum camphor, oil of and pulverized charcoal, molded in solid cakes.

826,488.—Apparatus for the manufacture of illuminating gas.   F. Egn

Brief.—Gas is generated in a furnace by the combustion of a mixture bituminous coal (about two-thirds), and coke (about one-third), caused by admission of air, and by the decomposition of steam, as much steam be admitted as is consistent with combustion of the fuel, and the resulting g are drawn off by an exhauster, which also serves to draw air into the chamber.   At the same time a rich gas is generated in a bench of retorts fr coal or oil, and is drawn off through the hydraulic main by the same hauster used to draw off the furnace gas, whereby the hydrogen and bonic oxide from the furnace, and the carbureted hydrogen from the ret are intimately mixed together.

September 22, 1885.

826,657.—Process of manufacturing permanganates.—T. Kempf.

Permanganates are prepared by treating the solutions of manganates el trolytically.

326,715.—Process of manufacturing and distilling alcohol and hydroc bons, and of rectifying and ageing liquors.—D. D. Cattanach.

326,716.—Apparatus for the manufacture and distillation of alcohol, drocarbons and acetic acid, and for ageing and refining liquors.—D. D. Ca nach.

326,760.—Process of extracting copper from its ores.—E. Marchese.

September 29th, 1885.

326,959.—Apparatus for making gas.   W. P. Elliott.

327,023.—Preservative for milk.   S. Sanborn.

Consists of sugar, salt, potassium nitrate, sodium carbonate, sodium hy sulphite and calcium sulphite.

327,034.—Apparatus for the manufacture of starch.   F. P. Stiker.

327,035.—Art of manufacturing starch.   F. P. Stiker.

The grain is steeped under pressure, so as to soften it, without disintegr ing it.   W. R

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—October 2d, 1885.

Dr. A. R. Leeds in the Chair.

The minutes of the meeting of September 18th were read.

The following gentlemen were elected members :

Dr. S. E. Simon, Littleton Avenue, Newark, N. J.; Russell W. Moore, A. B., M. S., 32 West 18th street, New York ; Dr. Boverton Redwood, 85 Gracechurch street, London, England ; Ferdinand Sustersic, Ph.D., Beaumont, Texas. The name of A. Einhorn, Ph.D., 12 Gramercy Park, New York, was proposed for membership.

Dr. II. Endemann read a continuation of his paper on Chinoline Compounds.

Dr. A. Einhorn gave a resumé of his paper on The Dynamics of Crystallization, read before the Royal Society in February last.

Messrs. Casamajor, Waller and Stebbins were elected as a Committee to select officers to be balloted for at the annual meeting. The Chair called a meeting of the Board of Directors for Friday, October 16th, in the Library.

The meeting was then adjourned.

C. E. MUNSELL, Recording Secretary.

# ON SOME CHINOLINE SUBSTITUTION-PRODUCTS.

By H. Endemann, Ph. D.

Between two and three years ago I made an investigation testing chinoline and some of its products with regard to its properties, when treated with bromine, chlorine and hypochlorous acid.

I found that free chinoline reacts by preference with 4 chlorine atoms ; the formation of a dichlorchinoline being the result, however ; monochlorchinolines are formed, but in smaller quantity.

Using one molecule of chinoline in ether solution and adding thereto 1 molecule of HClO, likewise in ether solution, a reaction soon sets in, which is marked by a growing turbidity of the liquid caused by a separation of water.

After the water had subsided, the ether solution was freed from ether by distillation and the residue was examined. As result it was found that practically one-half of the chinoline had entirely escaped the reaction, while the other half had been converted into a dichlorchinoline, as was proved by analysis.

Tetrahydrochinoline hydrochlorate in water solution, when shaken with a solution of bromine in water, yielded at ordinary temperatures, as end-product, a dibromtetrahydrochinoline. The substance had lost its basic properties to such marked degree that I considered that one bromine atom which had entered the composition must be in direct connection with the nitrogen atom thus :

N
Br
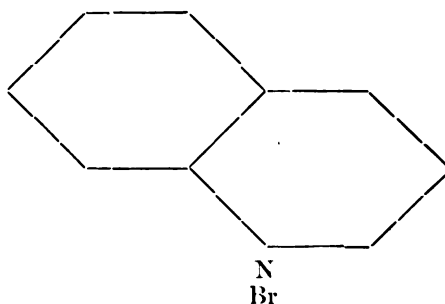
Repeating the same experiment, with methyltetrahydrochinoline, a monobromtetrahydromethylchinoline was obtained. The analysis of the product gave 33.8 % bromine. The result is the same if, instead, the bromine is first dissolved in NaHO and then

liberated by $H_2'SO_4$. Ether dissolves from the acid solution, the monobrom- compound. The water solution yields to ether yet another compound, after it has been made alkaline, which substance, however, has not been examined.

In order to ascertain where the bromine had entered the chinoline molecule, I modified the process, so as to arrive, if possible, at a compound, which could be easily distinguished by a simple chemical reaction.

The orthoxymethyltetrahydrochinoline, when treated with ferric chloride was then known to produce a dark red color ; the para- compound, which I prepared for the purpose, produced a green coloration ; the [corresponding meta- compounds I have not compared.

In order to prepare an analogous compound, I proceeded as follows : I prepared the acetyl compound of tetrahydrochinoline, dissolved it in ether and shook the ether solution with so much bromine in water solution as would produce a monobrom- substitution product. The layer of ether was removed, and the water solution repeatedly shaken with ether.

After uniting all the ether solutions, the ether was distilled off, and the residue boiled with a strong hydrochloric acid in order to split off the acetyl group.

On cooling, the mass became almost solid, with crystals of monobromtetrahydrochinoline hydrochlorate. This salt is quite difficultly soluble in water containing free hydrochloric acid, and can, therefore, easily be separated from impurities. Pure water decomposes the salt in part into free hydrochloric acid and mono-bromtetrahydrochinoline.

Alkali separates the free base (melting pt. 33° C). The hydrochlorate examined for bromine gave 31.86 % Br., calculated 32.19 % Br. If the free base be dissolved in methyl or ethyl alcohol, and be mixed with sodium methylate or ethylate in calculated quantity, and heated in a sealed tube to 140° C, even for a long time, no reaction ensues. If the temperature be raised to 180° C, the bromine can be replaced in part by either oxymethyl or oxyethyl, but the reaction can never be brought to an end owing to the high pressure, which is produced by the simultaneous formation of gases, especially in the case of the methyl compound. It is best, therefore, not to prolong the heating too far and to be content with a partial reaction.

If the contents of the tubes, after filtration and evaporation of the alcohol, are treated with hydrochloric acid, an easily soluble hydrochlorate and the difficultly soluble hydrochlorate of the monobrom- compound are formed, and these can easily be separated. The solution containing the easily soluble hydrochlorate yields, on addition of an alkali, the free base, as an oil which is best separated from the liquid by means of ether, from which it is recovered by distilling the ether off. These bases, whether produced by means of ordinary alcohol or methyl alcohol, produce, with a solution of Fe_2Cl_6, a deep indigo-blue color, which gradually disappears, leaving a mixture of a brownish color.

The hydrochlorate of the methylated base gave 18.6 % of hydrochloric acid—calculated 18.3 %.

0.2635 of the hydrochlorate precipitated with Ag NO_3 gave 0.145 Ag = 0.049 HCl.

Platinum chloride gives, in a solution of the hydrochlorates of these bases, at first a yellow precipitate, but soon, especially with an excess of platinum chloride, the solution turns blue, and finally, again yellow. When the bases are heated in a closed tube with hydrochloric acid, the resulting base fails to give the reaction with $Fe_2 Cl_6$, which is evidently due to the removal of the methyl or ethyl group from the compounds and their replacement by hydrogen. The base thus obtained is not soluble in excess of alkali, which would prove that the bromine substitution had not taken place in the benzol nucleus.

The iron reaction with the compound thus obtained results in the production of a dark, amber-colored liquid. The very unsatisfactory yield of the compounds in question, by the method described, suggested the melting with soda at 180° C., and subsequent conversion of the oxy- compound into the methyl ether. But the reaction went differently from expectation. Most of the monobrom- compound was converted into hydrochinoline, which is formed by the removal of H Br. from 2 molecules of the compound and union of the two resulting molecules. The hydrochlorate of hydrochinoline was obtained by evaporating a solution of the base in excess of hydrochloric acid under the air pump, over lime and sulphuric acid, and the quantity of hydrochloric acid therein was determined by dissolving in water, to which some dilute nitric acid had been added, since the salt is partly decomposed by

water, and then precipitating with silver nitrate. 0.0945 of the hydrochlorate gave 0.065 Ag.

Alkalies liberate the base as an amorphous precipitate with a melting point close to 160°C.

From these reactions, I should judge that the substitution of the bromine for the hydrogen in the original compound, had taken place on the pyridine nucleus of the tetrahydrochinoline.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Examination of the Humite Minerals. C. VON WINGARD.

The three types of Vesuvian humite as well as chondrodite from Nyakopparberg and humite from Ladugrufoan were carefully analyzed by the author, who infers from his results a similar chemical structure and ascribes to them the common formula. $Mg_{13}.(Mg\ F)_4.(Mg.\ OH)_2\ (Si\ O_4)_8$ (*Zeit. anal Chem.*, 24, *344.*)   F. P. V.

Detection of Fatty Oils when Mixed with Mineral Oils. F. LUX.

A. The fatty oil is in large amount—10% or more. A small piece of caustic soda is added to 5 C.C. of the mixed oils in a test-tube; boil 1–2 minutes. A burning smell is noticed and the fluid gelatinizes on cooling.

B. If a negative result is obtained above, take two medium-sized beakers fitting into one another, with a space of 1–2 cm. between the bottoms. In the larger, melt paraffine till it fills half way between the sides of the two beakers. The inner beaker is filled with paraffine to the same height. This forms a convenient oil-bath, and a thermometer in it marks the temperature. Two test-tubes hold portions of the oil. In one, small pieces of sodium, in the other, a little stick of caustic soda is put. They are heated, without shaking, 15 minutes at 200–210°C and then cooled. Even 2% of a fatty oil gives a jelly on cooling. (*Zeits. anal Chem.*, 24, *357.*)   F. P. V.

Composition and Analysis of Commercial Quinine Sulphate. W. KOPPESCHAAR.

Pure quinine sulphate has, according to most chemists, the formula $(C_{20}H_{24}N_2O_2)_2.\ H_2SO_4+7H_2O$. It generally contains cinchonidin sulphate, and the presence of this has caused, in the author's opinion, a loss of 1% in the water determinations. He agrees with Hesse, Flückiger and Robiquet in assigning $8H_2O$ to the crystals. The assayer of quinine usually contents himself with a water determination. The quinine, which really decides the

value, should be directly determined. This can be done by three methods: the herapathite method; the separation of ether; the optical method. These methods are discussed and the inaccuracy of the ether separation shown. Special stress is laid upon the advantages of the optical method. (*Zeit. anal Chem.*, **24,** *362.*)

<div align="right">F. P. V.</div>

ORGANIC CHEMISTRY.

On o-Nitranilinsulphonic acid] and a New Method of preparing o-Nitranilin. R. Nietzki and T. Benckiser.

The sodium salt of acetylsulphanic acid was dissolved in 5 pts. of strong H_2SO_4, cooled, and treated with the calculated amount of HNO_3, (previously mixed with a little H_2SO_4). The reaction-product was poured upon ice, the acid neutralized with lime, and the dark yellow solution of the easily soluble lime salt freed from $CaSO_4$ by filtration. During this process the acetyl group is partly eliminated. The solution of the lime salt was concentrated by evaporation, and the complete removal of the acetyl group accomplished by adding a little dilute H_2SO_4, and boiling for a few minutes. The nitroamidosulphonic acid formed yields a well-crystallizing K salt.

In order to determine the position of the NO_2 group, it was necessary to remove the SO_3 group. This was accomplished by heating the K salt in a sealed glass tube with strong HCl. From the reaction-product orthonitranilin was isolated. The NO_2 group is therefore in respect to the NH_2 group, in the ortho-position. Finally it was tried to sulphonate acetanilide directly, and by nitrizing this to obtain an amidonitrosulphonic acid. This the authors accomplished, producing a compound identical with the above. (*Ber. d. chem. Gesell.*, *1885, 294.*)

<div align="right">J. H. S., Jr.</div>

Reten. Bamberger and Hooker.

Taking the so-called dioxyretisten as a starting point, all of the important reactions of phenanthrenchinon were repeated with it, showing a perfect analogy between the two bodies. The presence of carbonyl having been shown, the more accurate name retenchi-

non is given to the body.   The empirical formula is also corrected to $C_{16}H_{16}$ (C_2O_2).   By oxidation of retenchinon with potassium permanganate in alkaline solution an acid, $C_{17}H_{14}O_4$ is gotten. This is oxidized by sulphuric acid and potassium bichromate to a second $C_{16}H_8O_6$: by melting this with potassium hydroxide a third is gotten, $C_{16}H_{10}O_6$, which is broken up into carbon dioxide and the hydrocarbon $C_{12}H_{10}$: by sodium amalgam a fourth, $C_{16}H_{10}O_4$ is formed, which, distilled with lime, yields a hydrocarbon $C_{13}H_{10}$.   By examination of these products the authors are led to the conclusion that retenchinon is methylpropylphenanthrenchinon.   Reten is then methylpropylphenanthren.   (*Annalen der Chem.*, 229, 102.)   F. P. V.

On Azonaphthalene.   R. Nietzki and O. Goll.

As the constitution of this body had up to the present time not been satisfactorily explained, the attempt was made to convert amidoazonaphthalene into azonaphthalene by Griess' method. After a number of fruitless attempts the authors finally succeeded in doing this by decomposing a-diazonaphthalene with boiling alcohol (*Ber. d. chem. Gesell.*, 1885, 297.)   J. II. S., Jr.

Contributions to a Knowledge of the Diazo-Compounds. T. Gasiorowski and A. Waiss.

From experiments of J. Effront, made in this laboratory, it was found that when the chlorides of diazo-compounds are treated with tin-salt, the hydrocarbons themselves are formed.

The object of this paper was to ascertain if the chlorides of diazo-compounds would react similarly with others than tin salts.   (*Ber. d. chem. Gesell*, 1885, 337.)   J. II. S., Jr.

Perchlorphenol from Perchlorbenzene.   A. Weber and N. Wolff.

From experiments made in this laboratory, it was found that perchlordiphenyl on being heated with alcoholicpotash is converted into perchlordiphenol.   Other aromatic perchlor-hydrocarbons show an analogous behavior.   By this reaction perchlorbenzol is also easily converted into perchlorphenol.   (*Ber. d. chem. Gesell*, 1885, 335.)   J. H. S., Jr.

On Phenol-dyestuffs. H. Brunner and W. Robert.

In the preparation of nitrosoresorcin, and nitrosoorcin by the action of amyl nitrite on the mono- sodium salts of the respective phenoles, and precipitating with dilute $H_2 SO_4$, it was found that the washings deposited, after a while, dark crusts, which at first were taken to be azoresorcin, and the corresponding compound of orcin. An examination, however, showed that only a mere trace of these compounds were present, while new coloring-matters had been formed. (*Ber. d. chem. Gesell.*, *1885, 373.*)

J. H. S., Jr.

On Methylformyl-o-amidochlorbenzoic Acid and Methyl-pseudo-chlorisatin from m-Chlorchinolinmethylchloride. W. La Coste and J. Bodewig.

The m-chlorchinolin discovered by the authors some time since must be represented by one of the following two formulæ :
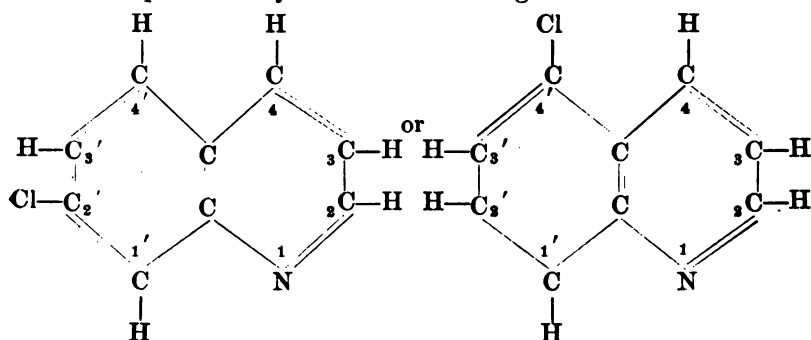
In the course of experiments made to determine the relative position of the chlorine atom in this compound, a derivative of isatin was obtained, whose formation from a chlorchinolin is not without interest. (*Ber. d. chem. Gesell.*, *1885, 428.*)   J. H. S., Jr.

On β-Amidoalizarin. H. Brunner and E. Chuard.

In the hope of obtaining a compound analogous to alizarin blue, β-nitroalizarin, erythrite, mannite, glycose or sacharose, and concentrated $H_2 SO_4$, were heated together ; in each case, however, the same product, namely, β-amidoalizarin, was obtained. From this it will be seen that the polyatomic alcohols do not react in the same manner with β-nitroalizarin as glycerine ; on the contrary, a reduction of the nitro- group takes place. (*Ber. d. chem. Gesell.*, *1885, 445.*)   J. H. S., Jr.

Synthetical production of Thiophen.   J. VOLHARD and H. ERDMANN.

If succinic anhydride and phosphorus pentasulphide are heated to 140° C. a violent reaction takes place.   The reaction-product is distilled, and the distillate shaken up with NaOH + aq, (in order to remove noxious-smelling products) and fractioned.   The fraction boiling between 83–84° C. is identical with V. Meyer's thiophen obtained from coal-tar benzene. A larger yield of thiophen is obtained from sodium succinate and phosphorus trisulphide. (*Ber. d. chem. Gesell., 1885, 454.*)   J. H. S., JR.

On Nitrosophenols.   H. GOLDSCHMIDT and H. SCHMID.

A short time since it was shown that the production of nitroso-phenols from chinons and hydroxylamine is an easy matter, and the authors now find that the reaction is a general one.

In this way phloron was converted into nitroparaxylenol. According to this new manner of production, nitroso-p-xylenol may be looked upon as a phloronoxim.

Phloronoxim on being oxidized with potassium ferricyanide, yields nitroparaxylenol, C_4H_2, OH', NO_2', CH_3', CH_3'. On heating phloronoxim with tin and hydrochloric acid, amidoparaxylenol-chloride is obtained, which on being treated with a dilute solution of chromic acid is converted, quantitatively, back into phloron. Alkalies precipitate the free amido-p-xylenol from the chloride. Experiments to determine the constitution of the two o-nitroso-naphtols were likewise made. (*Ber. d. chem. Gesell.,* 1885, *568.*)
          J. H. S., JR.

Upon the Action of *p*-Amidodimethylaniline on Aldehyde. G. NUTH.

It was shown a short time since by A. Cahn, that benzalde-hyde reacts with the greatest ease upon *p*-amidodimethylaniline, forming a compound $C_6H_5CH=N-C_6H_4N$ $(CH_3)_2$ which he called benzylidenamidodimethylaniline. The present investigation was undertaken with the view of ascertaining whether other alde-hydes would react in the same manner with *p*-amidodimethylaniline.

Salicylaldehyde   gave   *o*-oxybenzylidenamidodimethylaniline, $C_6H_4(OH)CH=N-C_6H_4N(CH_3)_2$. Fine crystals, melting at 134° C., and easily soluble in alcohol and ether. The compounds turn red on being exposed to the air.

From cuminol under the same conditions, ·cumylidenamidodimethylaniline [$C_6H_4(C_3H_7)CH=N—C_6H_4N(CH_3)_2$] was obtained. This compound is easily soluble in alcohol and ether.

Anisaldehyde gave *p*-methoxybenzylidenamidodimethylaniline, $C_6H_4(OCH_3)CH=N—C_6H_4N(CH_3)_2$.

Paraoxybenzaldehyde, cinnamic aldehyde, and piperonal were likewise tried, and in each case gave the corresponding benzylidencompound. (*Ber. d. chem. Gesell.*, 1885, *573*.)   J. H. S., JR.

On the Products of the dry distillation of Benzene sulphonate of Ammonium. KARL EGLI.

When the ammonium salt of benzene sulphonic acid is submitted to dry distillation for the purpose of removing the HSO_3 group, besides the benzene, a small amount of a high-boiling oil is obtained, the nature of which forms the subject of this paper. After the benzene had been distilled off at 85°C., the remaining high-boiling oils were shaken up with NaOH and aq., then acidified, which caused a few drops of a bad-smelling oil to separate out. This, on xamination, was found to be phenylmercaptan C_6H_5SH. The oils remaining from the treatment with NaOH, were shaken up with HCl, which, when made alkaline, gave a small amount of chinoline. The oils not soluble in NaOH, and HCl, were fractioned, and from the raction, boiling at 240°–280°C., sulphobenzid ($C_6H_5—SO_2—C_6H_5$) was obtained. From the same fraction after removing the sulphobenzid, diphenyl, and phenylsulphid, were obtained. (*Ber. d. chem. Gesell.*, 1885, *575*.)   J. H. S. JR.

Abstracts of American Patents Relating to Chemistry.

October 6th, 1885.

327,514.—Waterproofing compound.—D. Blackburn.

Composed of glue, soap, flour, salt and water.

327,541.—Method of making illuminating gas.—W. P. Elliott.

A generating furnace is charged with fuel and the products of combustion are passed through the retort chamber and around the retorts. Steam is then decomposed in the furnace, and the resulting water gas also passed through the retort chamber and around the retorts. Hydrocarbon liquid is admitted directly into the retort chamber and vaporized around the retorts, the vapor being immediately taken up by the water gas. The gas and products of distillation mingle, and are delivered at the ends of the retort chamber and retorts most distant from the generating furnace.

327,567.—Peptone-Pepsin.—M. B. Manwaring.

A solution of pepsin is allowed to act upon an acidulated mixture of coagulated egg albumen with water, and the resulting product is reduced to scale by evaporation.

327,599.- Apparatus for dyeing and sizing.—S. Sanford.

327,618.—Gas furnace.—W. Swindell.

327,636.—Process of treating butter.—E. J. Woodruff.

White wine, rennet, sugar, salt, sodium bicarbonate, potassium bicarbonate, alum and butter are added to the milk.

327,646.—Filter.—C. W. Bingham, Jr.

327,678. -Manufacture of paint from metallic lead.—W. E. Harris.

Lead is burnt in contact with coke, coal or charcoal, and the resulting fumes are condensed.

327,709.—Retort and crucible furnace.—J. R. Moffitt.

327,804.—Charcoal kiln.—W. A. Lovelace.

327,813.- Waterproofing fabric. -F. S. Mitchell.

The fabric is immersed in an alkaline solution of an aluminium soap, dried, and then passed through a solution of a metallic salt.

327,844.—Gas generating apparatus.—F. R. White.

Brief. - Gas from benches of coal distilling retorts, oil vapors, products of combustion from a furnace, and heated air are passed in a heated condition into one or two mixing chambers having fuel chambers below and loosely laid brick above, and provided above the brick with suspended iron chains for removing certain impurities from the gas. The retorts of each bench are connected at alternated ends by valved pipes, and valved pipes connect the lower retort of each bench with each mixer. The hydrocarbon oil vaporizer is

placed in the lower and rear portion of the retort furnace, and is connected to each mixer. An air pipe opening above a water pipe in the base of the retort furnace connects with the base of each mixer.

827,871.—Compound for harness oil.—C. M. Ely.

Consists of paraffin oil, neat's-foot oil, gum, gum arabic, raw linseed oil and ivory black.

827,929.—Fire extinguishing compound.—G. W. Eddison.

Consists of vinegar, oil of vitriol, copper sulphate, zinc chloride, alum and phosphorus.

327,953.—Production of blue dye stuffs.—A. Kern.

Triphenyl rosanillue is prepared by the action of carbon oxychloride (phosgene) upon methyldiphenylamine, digesting the warm mass with zinc chloride and carbon oxychloride, separating the base and finally purifying by washing with acids.

Issued October 13th, 1885.

827,981.—Carburetor.—C. F. Andrus.

827,984.—Glass furnace.—J. Ashcroft.

827,985.—Paraffin oil freezing machine.—W. Asher.

828,016.—Apparatus for preserving by vacuum and pressure.—D. H. Dickinson.

828,024.—Method of treating cottonseed oil.—J. B. Grant.

The cottonseed oil is distilled in presence of nitrogen. The oil is treated by distilling, freezing, pressing, mechanically agitating with other fat and freezing the combined product. Oil is frozen by direct contact with compressed carbon dioxide.

828,042.—Combined cupola furnace and converter.—Mr. Lysett.

828,066.—Apparatus for making solutions of bisulphites.—E. B. Ritter and C. Kellner.

This is an apparatus for the continuous production of bisulphites.

828,073.—Composition for graining wood. A. Smith and P. A. Zelie.

Consists of beer, alcohol, benzoin, acid and turpentine.

828,097.—Furnace for the manufacture of zinc white. S. C. West.

828,134.—Gas scrubber. J. McKay.

828,149.—Apparatus for manufacturing gas. L. Stevens.

Brief : Illuminating gas is made by first distilling coal or carbonaceous material in connection with highly superheated steam passed through the coal retorts, and the resulting gases are passed through a vertical retort containing highly heated coke, and from thence through a more highly heated finishing retort, into which is also admitted the fixed gas obtained by the admixture of superheated steam with a volatile hydrocarbon within a highly heated retort, under great pressure, whereby the gas is enriched to the desired candle power. The hydrocarbon retort is placed within the mixing retort, and has a valve and opening at its rear end.

828,150.—Apparatus for manufacturing illuminating gas. L. Stevens.

Brief : Superheated steam, at a temperature of 1000° to 1500° F., is passed into the distilling coal in the lower chamber of the retort, and the resulting gases and vapors are fixed in the upper chamber of the retort. A horizontal partition of loose tile resting on side ledges forms the two chambers communicating at the rear end of the retort. The mouthpiece of the retort has a partition matching the tile partition, and the lid closes both chambers. Steam superheaters are placed in the furnace flues.

828,151.—Process of manufacturing illuminating gas. L. Stevens.

828,173.—Glass furnace. W. T. Armstrong and R. H. Thomas.

828,223.—Process of preserving. W. Ihuc.

Brewers' grains are preserved by first draining them, and then successively treating them with a solution of common salt, a solution of dextrine and a solution of potassium permanganate. The mass is then formed into cakes by pressure.

828,226.—Manufacture of mineral wool. H. Kennedy and J. W. Higgs.

A stream of molten slag is subjected to the action of an encircling jet or jets of steam or air.

828,227.—Apparatus for manufacturing mineral wool. H. Kennedy and J. W. Higgs.

828,239.—Alloy for coating metals. C. E. Manby.

Consists of tin, 23-30% ; antimony, 0.5-8.0% ; lead, 50-70% ; bismuth. 0.25-5.0%.

828,250.—Fire extinguishing compound. W. H. Polleys.

The mixture, which is to be used for drying, preserving from decay, and rendering fireproof all kinds of wood material, consists of borax, potash, alum, mica cut in hydrochloric acid, glue, salt and water.

828,300.—Process and manufacture of cigarette wrappers, etc. J. de Susini.

828,309.—Process of purifying coal gas. J. G. Hawkins.

The oxide of iron is revivified in the purifying boxes by passing carbureted atmospheric air mingled with coal gas through the oxide of iron, the air being either at the normal temperature, or heated to a degree below that at which the heavy hydrocarbons of the tar are volatilized.

328,316.—Apparatus for distilling. F. T. King.

328,333.—Filter. E. Noppel.

328,334.—Apparatus for the treatment of sewage. S. K. Page, C. E. Robinson and W. Stevens.

328,359.—Automatic gas machine. J. Stubbers.

328,364.—Lactate baking powder. H. G. Underwood.

Consists of an acid lactate, and the carbonates or bicarbonates of the alkaline earths.

828,366.—Compositions for pencil leads and crayons. C. Walpuski.

828,389.—Regenerative furnace for steel making. F. W. Dick and J. Riley.

828,400.—Apparatus for the manufacture of illuminating gas. J. D. Guyer.

828,408.—Gas scrubber. C. W. Isbell.

828,419.—Baking powder. G. A. Marsh.

Consists of acid calcium lactate and an alkaline carbonate or bicarbonate, one or both being previously treated with an oleaginous body, to prevent a reaction during storage.

828,431.—Photographic sensitive paper. T. C. Roche.

The paper or other flexible support is covered with two separate sensitive faces of gelatine silver emulsion.

828,445.—Vermin poison. J. D. Womack.

Consists of carbon bisulphide, sulphur, potassium cyanide, phenol and phosphorus.   W. R.
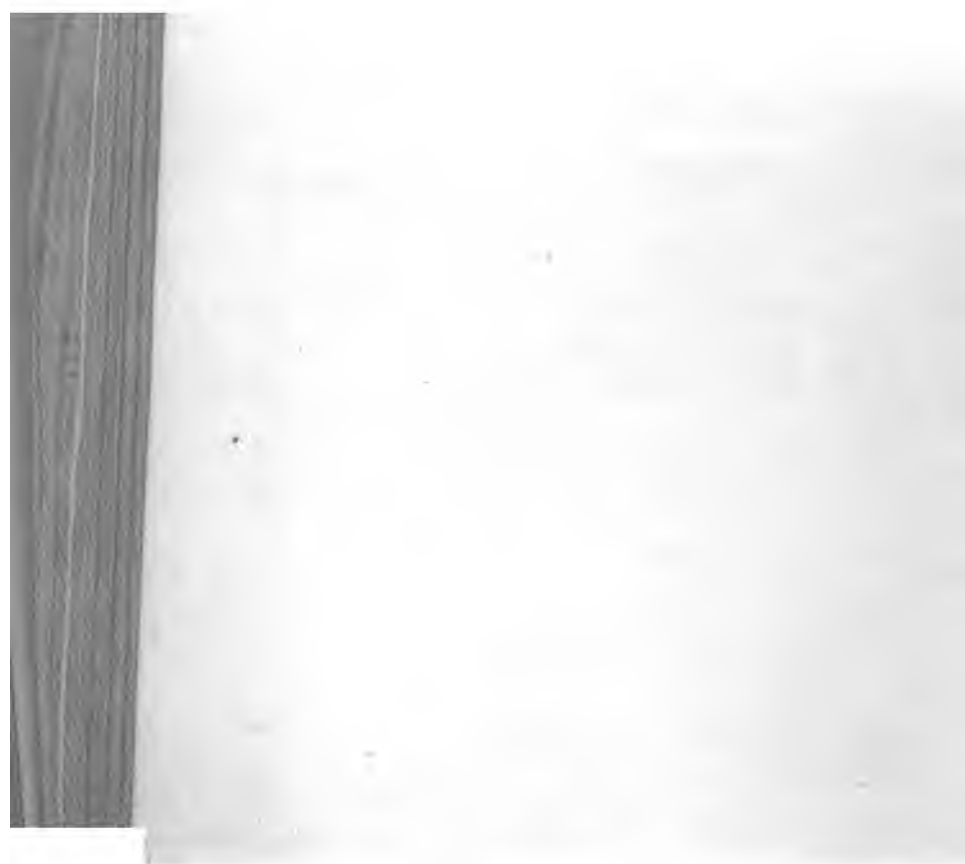
PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING, November 6th, 1885.

The President, Dr. J. C. Booth, in the chair.

The minutes of the meeting of October 2d were read and approved.

The minutes of the meeting of the Board of Directors of October 16th were read.

The Committee on Nomenclature, through Prof. Breneman, reported progress, and the report was made a special order for the January meeting.

The Committee on Selecting Officers for 1886 reported through Mr. Casamajor. The list of candidates was ordered to be printed and sent to each member.

Dr. A. Einhorn, of No. 10 Gramercy Park, New York City, was elected a regular member.

Mr. Milton W. Grovesteen, of No. 430 West 23d street, was proposed for membership.

The following papers were then read :

Decomposition of Phosphates by Sodium Bisulphate, by C. W. Volney, Ph.D.

An Analysis of *Sam-shu*, a Chinese Liquor, by C. E. Munsell, Ph.D.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

THE DECOMPOSITION OF PHOSPHATES BY SO BISULPHATE.

By C. W. Volney, Ph.D.

In giving an explanation of the circumstances under wl examination forming the subject of this paper was sugges undertaken, I intend to show, by way of introduction, how facturer is sometimes embarrassed by accumulations of by-p which, though of intrinsic value, and capable of technical uses on his hands, and compel him to study the location and the s in general, in order to dispose of them.

Ten or more years ago the manufacture of strong nitric a in America, a very limited one. I was compelled to man it myself, being largely interested in the production of n cerine. The consequence was, that in the years 1874 to 18' gradually accumulated considerable plant at my works in (Canada; and with this also a very large amount of "nitr or sodium bisulphate.

There was then no conceivable use for this salt in Ca would not admit of any expensive handling or costly tra tion, and so it was heaped up, month after month and ye year.

The amount which thus had collected I cannot now e proximately estimate; but an idea may be formed by con that for several years, during seven or eight months of ea ten thousand pounds of nitric acid per week, or thirty tl pounds of mixed acid were made. The resulting sodiu phate formed quite a large, hill-like prominence on the sl the St. Lawrence river.

I had for a year or two been looking in vain for a cust take it away for nothing. Then it came to my notice tha quantities of apatite—the Canadian phosphate—were mine ferent localities of Ontario and Quebec, and I then made trials of the effects of the bisulphate upon the apatite. I s at that time, a priori, that one half of the acid would certa upon the mineral, and the first experiment verified this However, any practical result which might then have been

was counteracted by other circumstances, among which were equally large accumulations of sulphuric acid and certain commercial relations, which there and then decided against the carrying out of any project for the practical use of the bisulphates in the decomposition of the Canadian phosphates.

As I have already indicated, the working of the process was merely tentative. The bisulphates were taken from the heap, without any examination, and thus used; the mineral phosphate was also taken as found upon the docks, indiscriminately picked up, crushed and mixed with the bisulphate, and melted with it. The molten mass was poured into cold water, the white precipitate of calcium sulphate washed by decantation, and in the solutions the amount of phosphoric acid was determined.

As I had ground several hundred pounds of the phosphates, from which the samples for trial were taken, and as we knew the average amount of phosphoric acid contained in the whole, the mineral, after grinding and mixing, having been analyzed several times, a comparison in each could be exactly made in each trial. Phosphate and bisulphate were, in all cases, intimately mixed together and melted in Battersea crucibles. The result was, that in no single case was more than one per cent. of phosphoric acid left undissolved. Of course, the product in solution was sodium pyrophosphate. The experiments at the works rested at this stage but the matter had interested me so much that I undertook, not long after, the additional investigation in the laboratory.

The apatite came from mines near Perth, in the province of Ontario. Several pounds of it had been finely pulverized, and phosphoric acid determined.

I abstained from deducting anything on account of water or any volatile substance, because I had a number of trials to make; the powder was left in a large beaker, and as it had been well shaken together, it could be safely supposed that samples taken from it had the same amount of phosphoric acid.

Three determinations were made; in each case 1 grm. of the mineral was dissolved in nitric acid; the undissolved residue amounted to:

I. 0.1110. II. 0.1130. III. 0.1110.

The phosphoric acid determinations were all made with ₁ date.

I. 0.3338712 phosphoric acid.
II. 0.3334100   "   "
III. 0.3338800   "   "

which would indicate for the mineral 33.4 per cent. of phos acid.

The nitre cake, or sodium bisulphate, originated from m works, from the Brockville Chemical Works, and from the Chemical Works. In this instance I deemed it of importance termine in each material the amount of water and of fr combined sulphuric acid.

1. *Determination of Water.*—For this purpose a combustio of 24 inches length was used, in which were introduced 5 g₁ the bisulphate. The combustion-tube was placed in a tro sheet copper, filled with paraffine and heated to 120° C. A c of air, dried over calcium chloride, passed over it and throug1 calcium chloride tubes. The figures obtained in this manner s considerable differences. I then selected a sample of each o three different salts, disintegrated it, to facilitate mixing, an obtain a uniform sample, and made three water determinat the manner above indicated.

The results were: In 5 grms.

Brockville Chemical Works: 0.110 ⎫
                            0.112 ⎬ = 2.2%.
                            0.112 ⎭

Lodi Chemical Works: 0.175 ⎫
                            0.169 ⎬ = 3.5%.
                            0.173 ⎭

My own manufacture: 0.501 ⎫
                            0.500 ⎬ = 6%.
                            0.500 ⎭

This great difference may be accounted for by the mai charging the retorts, and of distilling nitric acid, and also storing of the nitre cake; the last, for instance, was mostly e to wind and rain. To ascertain the amount of free acid, 5 g

the three different materials were dissolved and treated volumetrically with normal caustic soda solution, with the following results:

Brockville Chemical Works: $\left. \begin{array}{l} 0.020 \\ 0.020 \\ 0.021 \end{array} \right\} = 0.4\%.$

Lodi Chemical Works: $\left. \begin{array}{l} 0.035 \\ 0.032 \\ 0.035 \end{array} \right\} = 0.7\%.$

III. My own works. $\left. \begin{array}{l} 0.150 \\ 0.150 \\ 0.148 \end{array} \right\} = 3\%.$

In the first series of investigation 1 grm. of phosphate mineral and 1.8 grm of bisulphates were thoroughly mixed and melted in porcelain crucibles, heated until white vapors appeared, and, after cooling, dissolved in water. The solution was filtered from the residue, which was invariably white and mostly calcium sulphate; then brought to 100 c.c. and of this 20 c.c. were used in each case for determination of phosphoric acid.

This course was followed with all of the samples of nitre cake on hand.

The results with the three different bisulphates were:

I.— $\left. \begin{array}{l} 0.064 \\ 0.069 \\ 0.065 \end{array} \right\}$ Loss : 0,0007.

II.— $\left. \begin{array}{l} 0.065 \\ 0.063 \\ 0.067 \end{array} \right\}$ Loss : 0.0017.

III.— $\left. \begin{array}{l} 0.064 \\ 0.067 \\ 0.067 \end{array} \right\}$ Loss : 0.0007.

In regard to conversion of diphosphate into triphosphate, I found it necessary to leave the liquid containing sodium pyrophosphate for at least three days with nitric acid in excess, before the molybdate determination could be successfully employed. Considering the results, I cannot account for the discrepancy between I. and II.; that between I. and III. might possibly be found in the greater amount of free acid in bisulphate III., and in the consequent easier decomposition of the mineral.

The idea suggested itself to obtain an idea of the temperature by which these decompositions commenced and could be carried out.

Several trials were made with boiling solutions of bisulphates and the same mineral; also mixtures of bisulphate and mineral were melted together in a paraffine bath, where the temperature could then easily be ascertained.

In all cases considerable quantities of phosphoric acid were found in solution, and when long enough heated, always very nearly the amount contained in the minerals.

It is certain that such phosphates will be decomposed—that is, the total amount of phosphoric acid will be found in solution as sodium phosphate, when boiling solutions of the bisulphates are used; and I have reason to believe that under pressure, and consequently at a higher temperature, this could be done in a comparatively short time.

In a very similar way all phosphoric acid contained in slags from the Bessemer or Thomas processes can be brought into solution as sodium phosphate; my investigation of this has not been finished, as the material was exhausted, and as I found it somewhat difficult to obtain slags of the desired kind in this country.

I wish to acknowledge the courtesies received from Robert Rennie, Esq., and J. Robison, Esq. (both now deceased), who furnished me with material required in this investigation.

Toms River, N. J., Oct. 28, 1885.

(*To be continued.*)

ANALYSIS OF SAM-SHU, A CHINESE LIQUOR.

By Charles E. Munsell, Ph.D.

The liquor known as *toddy, arrack, saki, tsin,* and by other names in Eastern Asia, is distilled from the yeasty liquor in which boiled rice has fermented for many days under pressure. Only one distillation is made for common liquor, but when greater strength is desired two or three distillations are made ; and it is this strong spirit alone which is rightly called *Samshu,* a word meaning "thrice fired." (The Middle Kingdom : S. Wells Williams. New York, 1883. Vol. 1, p. 808.)

This liquid, which has the color of rich sherry wine, is imported in large quantities and is sold here (New York City) in the shops of Mott and Pell streets to Chinamen, who are very fond of it, not only for drinking but for preparing their opium for smoking. It is not agreeable to the taste of Caucasians, as it tastes and smells like spoiled Jamaica rum. Hitherto the proprietors of the Chinese shops, where it is retailed, have refused to take out licenses because they did not consider the liquid intoxicating; in consequence of this refusal a sample was sent to the Health Department by the Excise Commissioners, with a request for its analysis. The results of this analysis are as follows :

Specific Gravity at 18°C		94.84
Percentage of Alcohol, by weight		38.81
" " " " volume		45.70
" " Saccharose		5.39
" " Glucose		1.19
" " Mineral constituents		.06
" " other Organic Solids		2.80
" " Total Solids		9.44

Dr. J. P. Battershall, of the United States Laboratory, Port of New York, obtained the following percentages of Absolute Alcohol in samples of this "Chinese Medicine" :

	Volume.	Weight.
No. 1	44.50	37.50
No. 2	33.10	27.27
No. 3	52 00	44.42

These analyses show that *Sam-shu* contains as much alcohol as any liquor usually sold.

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Percentage of Alcohol, by weight 38.81
  "   "   "   " volume 45.70
  "   " Saccharose 5.39
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  "   " Mineral constituents ..... .06
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  "   " Total Solids 9.44

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ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Chlorine Monoxide. K. GARZAROLLI-THURNLACKH and G. SCHACHERL.

A new investigation of this compound shows many errors in the accounts of earlier investigators. Careful analyses were made to prove the purity of the gas. It is yellowish-brown and in the liquid form dark-brown. It is not easily decomposed by sunlight, nor does it explode when evaporated at ordinary temperatures if organic matter is excluded. Concentrated aqueous solutions are colored golden-yellow. The gas has an extremely unpleasant odor and attacks the respiratory organs. Two determinations of its vapor density gave 43.69 and 43.42. Under a pressure of 737.9 m. m. it boils at 5.0°–5.1°. It causes a partial decomposition of calcium chloride into calcium hypochlorite, which the authors propose to investigate. (*Annalen der Chemie*, **230**, *273*.)   F. P. V.

Solidification. E. REYER.

The phenomena of solidification of lavas and metals are briefly pointed out. The accompanying crystallization, pulverization and contraction are discussed. The interpretation of the observed facts does not support Mallet's theory, as to the contraction of the earth. (*Jour. prakt. Chem.*, **32**, *120*.)   F. P. V.

Purification of Sulhpuric Acid. M. KUPFERSCHLAGER.

The author reduces the arsenic acid to arsenious by the means of gaseous sulphur dioxide, which is passed through the acid diluted with its weight of water. He then precipitates arsenic, lead and selenium by H^2S, passed to saturation, and allows the precipitate to settle in a closed vessel.

The acid is decanted into a retort, in communication with a tubulated receiver, the tubulure being directed downwards into the wide mouth of a glass jar. The retort rests upon a cold sand bath and is surrounded by a double, circular grate filled with cold coke on top of which is ignited coal. The top of the retort is covered by a sheet iron dome. The jar does not need artificial cooling. (*Bul. Soc. Chim.*, **44**, *353*.)   M. L.

ORGANIC CHEMISTRY.

On Cyanogen Compounds of the Aromatic Orthodiamines. J. A. Bladin.

Cyanogen combines easily with aromatic orthodiamines (1 mol. C N and 1 mol. diamine) to form compounds having the general formula $C_n^- H_{2n-8} N_4$ (where n=8.9, etc.), which are more stable than the cyanogen compounds of monamines. They are very strong bases, forming with acids two series of salts, containing 1 or 2 mols. of a monobasic acid. On heating these compounds on the water-bath with HCl, an NH group is split off and replaced by an oxygen atom

$$C_n H_{2n-8} N_4 + H_2 O = C_n H_{2 n-9} N_3 O + NH_3$$
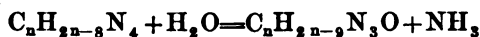
The oxygen compounds so obtained are likewise bases, but weaker than those from which they are derived. They unite with 1 mol. of a monobasic acid to form salts which are easily decomposed by water. They likewise have the character of weak acids, as they are soluble in KOH, but are precipitated therefrom by CO_2, etc. (*Ber. d. chem. Gesell.*, 1885, 666.)   J. H. S., Jr.

On a few Benzoyl Derivatives of Aromatic Amines. O. Hess.

Benzoyl chloride on being heated with dimethylaniline for some time at 190° gave benzoylmonomethylaniline. Large, clear crystals melting at 63°.

Benzoylmonethylaniline was likewise obtained from benzoyl chloride and diethylaniline. Crystals similar to those of the previous compound, melting at 60°.

Benzoylmonomethyl-α-naphthylamine was obtained from dimethyl-α-naphthylamine. Light colored crystals. Melting point 121°. (*Ber. d. chem. Gesell.*, 1885, 685.)   J. H. S., Jr.

Benzyl ethers of the brominated nitrophenols, and their behavior by reduction. G. Roll and O. Hölz.

Mono- and dibrom-o-nitrophenol and mono- and dibrom-p-nitrophenol were used in this research. The benzyl ethers were formed by the action of benzyl chloride upon the salts of the brominated nitrophenols. These were subjected to the action of tin and hydrochloric

acid, and were not only reduced, but at the same time saponified. Instead of the expected amidobenzyl ether, amidophenols were obtained. Other reducing agents were tried, but no amidobenzyl ethers were obtained, unless an unexamined substance gotten with sodium amalgam should prove to be the ether. (*Jour. prakt. Chem.*, 32, 56.)   F. P. V.

p- Brom-o-amidophenol. F. SCHÜTT.

p-Brom-o-nitrophenol was reduced with tin and hydrochloric acid. The brominated amidophenol was then gotten in the form of slightly yellow needles, soluble in cold alcohol, ether and benzol and in hot water, chloroform and carbon bisulphide. Melting point 128°. Various salts were examined. The base seems identical with the reduction product from p-brom-o-nitrophenol benzyl-ether described above. (*Jour. prakt. Chem.*, 32, 61.) F. P. V.

Bromamidophenols.

These bodies were gotten by the reduction of the bromnitrophenols, or their benzyl ethers. The paper contains an account of the preparation of several of these, together with their compounds, and a description of some of their physical properties. (*Jour. prakt. Chem.*, 32, 65.)   F. P. V.

Contributions to a Knowledge of the Terpenes and Essential Oils. O. WALLACH.

This is a continuation of the research noticed in previous abstracts. Borneol is shown to act as a saturated secondary alcohol, having, however, the power to form unstable compounds with bromine and the halogen hydrides. By means of potassium bisulphate camphene can be isolated from borneol. Borneen is a mixture of the decomposition products of camphene. Camphene, on treatment with bromine, gives a monobromide while dipentine gave a tetrabromide. Russian and Swedish turpentine are identical and consist of pinene, sylvestrene and dipentene. Sylvestrene gives a chloride melting at 72°. Terpinol, $C_{20}H_{24}O$, does not exist. Terpin hydrate is saturated and melts at 116–117°. On boiling with acids terpinol is formed. This is a nonsaturated monatomic alcohol. It gives a dipententetrabromide, also a chloride melting at 70°.

Terpinen is formed by decomposing terpin hydrate by dilute sulphuric acid. The author appends a classification of these terpenes depending upon their boiling points and halogen compounds. (*Annalen der Chem.*, 230, *225.*) F. P. V.

On Lemon Oil. G. BOUCHARDAT and J. LEFORT.

The authors find that on distillation and treatment of oil of lemon with dry HCl, the solid monochlorhydrates obtained have, in general, the properties of the chlorhydrate of turpentine—boiling point between 205° and 208° and melting between 129° and 133°—but differ in optical properties. They are all laevorotatory, while all of the hydrocarbons were dextrorotatory. Water hardly acts upon these hydrochlorides.

The authors conclude that lemon oil is a very complex body, composed principally of hydrocarbons of the $C^{10} H^{16}$ class and a small quantity of cymole. The most abundant of the hydrocarbons of the $C^{10} H^{16}$ class is citrene, boiling at + 178°, rotating polarized light more than + 105°, and yielding directly a dichlorhydrate without optical properties. There are several hydrocarbons boiling below 162°, whose monochlorhydrates differ in rotatory power. (*Repert. de Pharmacie* 13,*443.*) M. L.

Lupanine from the Seeds of Lupinus Angustifolius. M. HAGEN.

This alkaloid was extracted by exhaustion with alcohol acidified with hydrochloric acid. After freeing from alcohol and concentrating it was made alkaline, shaken with petroleum ether and the base removed with hydrochloric acid. The alkaloid forms a honeylike, uncrystallizable syrup, yellow with green fluorescence, intensely bitter taste and has an unpleasant odor. It attacks the skin and fumes with hydrochloric acid. It is slightly soluble in water, difficultly in alcohol, easily in ether, chloroform, etc. It cannot be distilled, not even with steam. From analyses of its salts, the formula $C_{15} H_{25} N_2 O$ is deduced. It is a mon-acid, tertiary amine base. (*Annalen der Chem.*, 230, *367.*) F. P. V

Cuprein and Homochinin. O. HESSE.

Cuprein loses its two molecules of water at 120–125° and then

melts at 198°. In acid solution it polarizes strongly to the left. It is a strong base forming neutral and acid salts, a number of which the author prepared and examined. With ammonia it does not unite, but does so with other inorganic bases. Diacetylcuprein results from the action of acetic anhydride upon cuprein. It melts at 88°. Concentrated hydrochloric acid changes cuprein into apochinin. Methyliodide gives cupreinmethyliodide, and the chloride is gotten by digesting this with silver chloride. Cupreinmethylhydroxyd is gotten by decomposing the methyl sulphate with baryta water. Cuprein combines with chinin to form homochinin. This last is to be stricken from the list of cinchona alkaloids. (*Annalen der Chem.*, 230, 55.)   F. P. V.

Fulminuric acid. A. EHRENBERG.

By the action of hydrochloric acid (under pressure and heated) on silver fulminurate, hydroxylamine and ammonium chloride were formed. Quantitative tests show that two nitrogen atoms of the acid go to form the ammonium chloride and one hydroxylamine. When the reaction takes place, at ordinary temperatures, hydroxlamine and a new nitrogenous acid substance were obtained. Potassium fulminurate suspended in alcohol, decomposed by hydrochloric acid, yielded an oily liquid which is not fulminuric ether, and which undergoes spontaneous decomposition. By continuing the action of hydrochloric acid a crystalline acid is gotten. (*Jour. prakt. Chem.*, 32, 97.)   F. P. V.

Chlor- and Bromfulminuric acid. A. EHRENBERG.

The experiments of Kekulé on this subject were made in the presence of water. In these experiments silver fulminurate was suspended in ether and chlorine passed through. Monochlorfulminuric acid is thus formed. The ether is removed by a current of air. The acid is decomposed by distillation, by water, etc. So too with its salts. Similarly, bromine is dropped into ether having silver fulminurate suspended in it and monobromfulminuric acid is gotten. This is soluble in alcohol and ether. It is more stable than the chlorine compound. The compound with iodine was obtained, but has not yet been fully examined. It is easily decomposed. (*Jour. prakt. Chem.*, 32, 111.)   F. P. V.

On Nitropseudocumene, Pseudocumidine and Pseudocumenol, holding the Position 1, 3, 4, 5. E. EDLER.

The mono-derivatives of pseudocumene known up to the present time belong to the symmetrical series 1, 3, 4, 6. In order to obtain isomers holding different positions, pseudocumidine was acetylated, then nitrated, and, after splitting off the acetyl group, the nitro-pseudocumidine was treated with nitrous acid and the resulting diazo- compound boiled with alcohol, thus obtaining a second nitro-pseudocumene, from which in turn the corresponding cumidine was obtained. (*Ber. d. chem. Gesell.*, *1885, 629.*) J. H. S., JR.

On the Occurrence of Carbo- Acids in Coal Tar. K. E. SCHULZE.

In the course of an investigation of the high-boiling phenols in coal tar, the author found also a carbo- acid, which, on investigation, turned out to be benzoic acid. (*Ber. d. chem. Gesell.*, *1885, 615.*)

J. H. S., JR.

ANALYTICAL CHEMISTRY.

Determination of Tannic Acid. F. JEAN.

In the middle of a piece of black cloth put a disk of 2 inches diam. cut from white paper. Place on the disk a beaker of 800 c.c. capacity, and 85 mm. in diameter. The beaker carries a mark indicating 200 c.c.

Put into the beaker 5 c.c. of a solution containing 10 c.c. HCl and 14 grammes of ferric chloride per litre and fill to the 200 c.c. mark with ordinary water. Then run from a burette a solution containing 0.1 grm. of pure tannic acid in 100 c.c. of water until the white spot made by the paper on the black cloth is no longer perceptible through the liquid of the beaker. By a similar operation with the decoction of the bark to be analyzed, the amount of tannic acid is easily determined. The essential condition is that the decoction shall contain about 0.1 % of tannic acid. This is secured by taking

1.5 grm. of European oak bark,
or 1. grm. of African oak bark,
" 0.5 or 0.6 grm. of quebracho,
" 0.4 or 0.5 grm. of bark extracts and sumac,
" 0.250 grm. of cachou.

The process gives, according to the author, an approximation within .5% of the total astringent expressed as tannic acid.

To determine the gallic acid a solution containing about 0.2 % of the astringent acids is taken ; 50 c.c. of this are diluted to 100 c.c. and total acids are determined as above. Then in 50 c.c. of the original solution are put 2 grammes of powdered skin, which are left for 2 hours, then filtered through muslin; the skin is washed, collecting all the liquids in a 100 c.c. graduate, and 10 c.c. of solution of pure tannic acid at 1 % are finally added.

The 100 c.c. contains 0.1 grm. of tannic acid, plus the gallic acid of the sample. The difference between the quantity of solution of tannic acid of 1 % and the quantity of solution to be employed to produce the obscuration of the white disk, is due to the gallic acid, and a calculation gives its amount. (*Repert. de Pharmacie*, 13,446.)   M. L.

A Test for Olive Oil. A. AUDOYNAUD.

Take a test tube 15 c.c. in length and 15 m.m. in diameter, divided into cubic centimeters, and measure into it 2 c.c. of the oil to be tested ; then add 0.1 grm. of finely powered potassium dichromate and shake for a few minutes. Pour in nitroso-sulphuric acid until the volume reaches 4 c.c., and shake again ; the liquid becomes brown-red ; after few minutes add enough ether (65°) to bring the volume to 5 c.c. The mixture is then agitated and allowed to stand a few moments when the oil comes to the surface with a peculiar coloration.

For pure olive oil this color is green ; an oil containing at least 5% of sesame oil, peanut oil, cotton seed oil, or poppy oil gives a coloration varying from yellow-green to yellow or even reddish-yellow. On adding water this color is more apparent. (*Repert. de Pharmacie*, 13,498.)   M. L.

On a New Separation of Nickel and Cobalt. M. TLINSKI.

The principle of this separation depends upon the formation of metallic nitroso- compounds with nitroso-β-naphthol, which have different degrees of solubility in HCl and $HC_2H_3O_2$, and may be separated from one another by filtration. (*Ber. d. chem. Gesell.*, 1885, 699.)   J. H. S., JR.

Volumetric determination of the alkaline earths, and the sulphuric acid combined with them.   O. KNÖFLER.

To the solution of the alkaline earths phenolphtalein methyl-orange is added, then hydrochloric acid to acid reaction, and the temperature raised to boiling. A two-tenths normal sodium carbonate solution is then added till a rose color is obtained, and then 1 c. c. in excess. Filter, wash and titrate with two-tenths normal acid. After deducting acid, the amount of sodium carbonate corresponds to the amount of alkaline earth present. Where these earths are mixed they must first be separated. Magnesium compounds must be removed, and the presence of ammonium chloride avoided. To determine the combined sulphuric acid a solution of hydrochloric acid is added to acid reaction, then sodium carbonate to alkaline, then an excess of a solution of barium chloride (alkaline reaction disappears). Then add sodium carbonate until the alkaline reaction is restored. Filter, wash and titrate with hydrochloric acid. Two-tenths normal solutions are used throughout. The number of c. c. of acid and barium chloride used, less the sodium carbonate multiplied by .008, give directly grams of SO_3. Modifications are given for special cases. (*Annalen der Chem.*, 230, *345.*) F. P. V.

On Fractional Distillation in a Current of Steam.   M. J. LAZARUS.

On one occasion the author had to separate two fluids, one of which volatized easily, while the other was decomposed at a rather low temperature. As the process of distilling in vacuo presented some difficulties, he tried to accomplish the separation by distilling with steam. Naumann has shown that fluids not miscible with water are distilled over by means of steam at temperatures lying below the boiling point of water. In fractioning a mixture of this kind, there is not much danger of decomposition. In distilling, care was taken not to use a too strong current of steam, and the distillate was collected in 2 or 3 portions, each of which was dried and fractioned separately. For example, a mixture of 25 c. c. toluene and 25 c. c. nitrobenzene was distilled in a current of steam, and 22.5 c. c. toluene and 23 c. c. nitrobenzene were recovered. (*Ber. d. chem. Gesell.*, *1885, 577.*)   J. H. S., JR.

Abstracts of American Patents relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

October 20, 1885.

828,464.—Mordaunt.—M. Conrad.

Consists of laevulinic acid, oil emulsion, thickening, such as starch and acetic acid, and a solution of tannic acid.

828,465.—Process of printing textile fabrics.—M. Conrad.

The fabric is printed with a color prepared with laevulinic acid, oil emulsion, acetic acid and starch, and a solution of tannic acid in tragacanth water, and then submitted to the action of steam.

828,477.—Manufacture of crystal alum.—H. C. Freist.

A solution of aluminium sulphate, containing iron, is treated with potassium chlorate, or other oxidizing agent, to convert the ferrous oxide into ferric oxide. Either after or before removing the impurities, potassium sulphate, ammonium sulphate or sodium sulphate is added to the solution, and the alum is crystallized out.

828,478.—Manufacture of hydrate of alumina.—H. C. Freist.

Bauxite, or other aluminous material, is pulverized and mixed with sodium sulphate, calcium carbonate, coal dust and fluor spar, and subjected to heat. The resulting mass is leached, and the solution treated with a metallic peroxide to remove the iron. The clear solution is then subjected to the action of carbon dioxide, to form sodium carbonate, and precipitate the aluminium as hydrated oxide.

828,523.—Manufacture of ice and apparatus therefor.—A. Schmitz.

828,532.—Electrical apparatus for separating gold from ores.—W. J. Tanner.

828,534.—Apparatus for preserving and pressing beer.—F. Widmer.

828,589.—Paint solvent.—J. Kotoba.

A mixture to remove paints, oils, or varnishes, consisting of rain water, sodium carbonate, vinegar and slacked lime.

828,611.—Process of remelting soap.—J. C. Ralston.

828,643.—Mixed paint.—L. Brown.

Consists of powdered sand iron ore, combined with whiting or other coloring matter.

828,644.—Powder for roofing and other purposes.—L. Brown.

Consists of pulverized sand iron ore.

828,645.—Calcimine compound.—S. N. Brunck and G. A. Marsh, Jr.

Consists of calcined plaster, cotton seed oil and water, formed into a paste, which is dried and ground.

828,666.—Paint remover.—F. P. Foster.

Consists of a mixture of potash, alum, burnt umber, wheat flour, carbolic acid and water.'

828,685.—Process of and apparatus for dehydrating and refrigerating air for the preservation of meat, etc.—H. C. Johnson.

828,708.—Beer still.—W. J. O'Connor, P. Walsh and E. L. Martin.

828,884.—Apparatus for generating gas.—W. F. Browne.

828,857.—Mixed paint.—C. Miller.

Consists of gloss, gum or resinous oil, sodium silicate, Prince's metallic, Rossie red, Venetian red, potash, copperas, alum, sal soda and solution of white lime.

October 27, 1885.

828,914.—Gas furnace.—J. Ashchroft.

828,925.—Device for extracting and refining crude oil.—J. Davis.

828,947.—Filtering paper.—S. H. Johnson.

Carbon is mixed with paper pulp and formed into sheets.

828,956.—Preserving, strengthening, waterproofing and glossing textile fabrics, including paper.—C. A. Maxfield.

Natural wax is applied to only one side of the fabric.

828,978.—Process of tanning.—G. F. Schweitzer.

The hides are cleansed in pure water, limed, submerged in a solution of salt and alum, exposed to the fumes of sulphur, and tanned in a solution of salt, alum, sulphuric acid and extract of bark.

829,058.—Gas producer for metallurgic operations.—N. Lilienberg and G. S. Dwight.

829,072.—Apparatus for distilling and concentrating liquids.—C. C. Peck.

829,078.—Distilling or concentrating liquids.—C. C. Peck.

829,074.—Process of distilling and concentrating liquids.—C. C. Peck.

829,093.—Utilizing celluloid, etc., in the production of enameled goods or veneering.—J. H. Stevens and W. H. Wood.

Sheets of celluloid, and material suitable to form a backing, are subjected to a high degree of heat and pressure.

829,115.—Apparatus for moistening and purifying air.—C. Wurster.

829,125.—Process of making coloring matter.—A. T. Boehme.

The glucosides derived from quercitrin, horse-chestnut, Brazil wood and the like, are boiled with water containing nitric or hydrochloric acid to precipitate the resin. The brazilin, etc., is then removed and treated with potassium permanganate, and the resulting precipitate is filtered and washed, after which the precipitate is treated with acid, cooled and neutralized.

829,138.—Manufacture of chromates and bichromates.—W. J. Chrystal.

Sodium chromate is decomposed with an alkaline sulphate, and the resulting alkaline chromate is converted into a bichromate by adding a suitable acid.

829,184.—Continuous filter for filtering sugar liquors.—F. O. Matthiessen.

829,185.—Bone black filter for filtering sugar liquors.—F. O. Matthiessen.

829,199.—Apparatus for smelting and calcining lead and other ore: Moffet.

829,210.—Apparatus for decolorizing sugar liquor by upward through bone black.—E. E. Quimby.

829,290.—Apparatus for making water gas.—P. E. De Mill, Jr.

Brief.—Products of combustion from a cupola furnace are used i steam superheating chamber, composed of brick arches and iron sc: ported thereon above the fuel chamber of the furnace, and a fixing c filled with brick, is also heated by waste gaseous products from the fu ber when blowing up with air. Steam is superheated and partiall; posed by passage down through the superheater in contact with hea and brick, and decomposition is completed in the fuel chamber belo resulting water gas is carbureted by liquid hydrocarbon in the base oi ing chamber, and the carbureted gas is fixed by passage up through th fixing chamber.

829,305.—Bone black discharger for continuous filters.—T. Gaunt.

829,306.—Bone black filter for filtering saccharine liquids.—T. Ga

829,318.—Manufacture of pyroxyline compounds.—J. G. Jarvis.

Gum damar, gum quaiacum or gum mastic, is mixed with pyroxyli or without pigments or other coloring matter, and fixed or volatile oil

829,329.—Bone black filter.—F. O. Matthiessen.

829,330.—Apparatus for decoloring saccharine and other liquids l tion through bone black.—F. Matthiessen and E. E. Quimby.

829,331.—Process of removing the impurities of raw sugar.—F. thiessen.

829,332.—Apparatus for decoloring sugar liquor by upward t through bone black.—F. O. Matthiessen.

November 3, 1885.

829,529.—Stove polish.—A. N. Bender.

Consists of damar varnish, turpentine, drier, black lead and gasolin

829,578.—Preserving compound.—R. A. McDaniel.

Consists of salicylic acid, sulphur, orange peel, cinnamon and po nitrate.

829,594.—Insecticide.—R. Rusterholz.

Consists of a solution of salicylic acid, sodium bicarbonate, starcl chloride, ammonium hydrate and a flavoring oil.

329,632.—Coloring matter obtained from tetrazoditolyl.—C. Duisbe

Is obtained by the action of tetrazoditolyl upon the alpha-naphth sulpho-acids.

829,633.—Coloring matter obtained from tetrazo-ditolyl.—C. Duisb

Produced by the action of tetrazo-ditolyl upon the beta-naphthylam pho acids.

329,684.—Red dyestuff or coloring matter.—E. Elsaesser.

Obtained by the reaction of the diazoderivative of the monosulpho acid of beta-naphthylamine, and the mono sulphoacids of alpha-naphthol, derived from naphthionic acid.

329,686.—Production of new violet dyestuffs.—F. Fischer.

Dimethylaniline is treated with perchlormethylmercaptan, and the coloring matter is extracted from the residual mass.

329,687.—Violet coloring matter.—F. Fischer.

329,688.—Yellow coloring matter.—E. Frank.

329,689.—Production of new yellowing coloring matter.—E. Frank.

Benzidine sulphate is azotized with sodium nitrite to form tetrazodiphenyl, and the latter is treated with oxybenzoic acids (especially salicylic acid).

329,701.—Manufacture of starch.—W. F. Birge.

329,740.—Paint for roofing, etc.—F. M. Hibbard.

Consists of coal tar, beeswax, resin, litharge, gypsum and asbestos.

329,774.—Composition for curing meats.—T. H. Riethmueller.

Consists of soda ash, potash, sal-soda, juniper berries, tartaric acid, sodium bicarbonate, potato farina, cream of tartar, pearl ash and caustic soda.

329,842.—Ice machine.—S. Luscher.

329,858.—Process of making lactose or milk sugar.—A. H. Sabin.

The evaporation of the whey is hastened by passing a current of dried or heated air over or through the liquid.

November 10th, 1885.

329,937.—Junction or separator lining for open-hearth furnaces.—O. Murisier and P. G. Gilchrist.

A furnace lining composed of a basic bottom, basic sides, and acid roof, and a belt of a mixture of chrome ore and tar interposed between the roof and sides.

329,960.—Oil compound for leather.—A. Schmitt.

Consists of cotton seed oil and cod fish oil, combined with a solution of rubber, cocoanut, pomegranate rind, and an aromatic.

329,967.—Process of manufacturing gas.—J. L. Stewart.

The process of manufacturing illuminating gas, which consists in heating a body of fuel to incandescence by means of an air blast, and by means of the resulting hot gaseous products heating up a fixing chamber, and at the same time generating a volume of oil vapor and storing it under pressure in a separate still or vaporizer; then decomposing steam by passing it into the incandescent fuel, carbureting or enriching the resulting water gas by admitting to it, above the fuel, the stored hot oil vapor in regulated quantity to produce a uniform high candle-power gas; and, finally, fixing the carbureted water gas by passing it through the fixing chamber previously heated by the hot gaseous products.

880,165.—Gas apparatus.—R. H. Smith.

880,171.—Treating asbestos to form crucibles.—M. S. Thompson.

Asbestos is mixed with water to form a plastic mass, which is placed in molds, and then exposed to a high temperature.

880,184.—Process of brewing beer.—C. Zimmer.

Malt is deprived of its hulls and germs, and subjected, with water, to the saccharification temperature. The mash is then boiled to coagulate the albuminous substance, and conducted to a centrifugal machine to separate the clear wort. The clear wort is finally passed into the hop kettle and boiled.

880,196.—Asphaltic mastic.—A. L. Barber.

Consists of refined Trinidad asphaltum, residium of petroleum, or heavy petroleum oil and pulverized limestone.

880,197.—Asphaltic cement for paving, roofing, etc.—A. L. Barber.

Trinidad or similar hard asphalt, combined with Trinidad, Mexican, Venezuelan or other naturally soft or liquid asphalt, sand and pulverized limestone.

880,274.—Process of obtaining menthol.—A. M. Todd.

880,275.—Composition of matter to be used in dyeing.—M. E. Waldstein and A. Mueller.

Consists of a sulpho-compound of the fatty acids, aniline or its homologues, and a neutralizing alkali.

880,884.—Process of preparing whole grain for fermentation.—J. W. Kittle

<div align="right">W. R.</div>

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING, December 4th, 1885.

Dr. A. R. Leeds in the chair.

The minutes of the meeting of November 6th were read and approved.

The Treasurer's Report was read, and Messrs. Alsberg and Casamajor were appointed a committee to audit the Treasurer's accounts.

The Committee on Papers and Publications reported, through Prof. Breneman that the Journal needs more co-operation from members in the preparation of abstracts.

Messrs. Liebschütz and Gladding were appointed tellers for the election of officers and committees for 1886.

The following officers were then elected to serve during the year 1886:

President:

A. B. PRESCOTT.

Vice-Presidents:

A. R. LEEDS,
A. A. BRENEMAN,
H. ENDEMANN,
T. G. WORMLEY,
H. B. NASON,
T. S. HUNT.

Corresponding Secretary:

P. CASAMAJOR.

Recording Secretary:

C. E. MUNSELL.

Treasurer:

T. O'C. SLOANE.

Librarian:

WILLIAM RUPP.

Curators:

M. LIEBSCHUTZ,   J. P. BATTERSHALL,   O. H. KRAUSE.

Committee on Papers and Publications :

JAS. H. STEBBINS, JR.,   A. A. BRENEMAN,   A. R. LEEDS.

Committee on Nominations :

J. B. MACKINTOSH,   M. E. WALDSTEIN,   A. C. HALE,
R. W. MOORE,   A. P. HALLOCK.

Board of Directors :

A. R. LEEDS,
A. A. BRENEMAN, } *Three Local Vice-Presidents.*
H. ENDEMANN,

P. CASAMAJOR,	C. F. CHANDLER,
C. E. MUNSELL,	M. ALSBERG,
T. O'C. SLOANE,	JAS. H. STEBBINS, JR.,
WM. RUPP.	M. E. WALDSTEIN,
E. WALLER,	T. S. GLADDING.

Milton W. Grovesteen, of 430 West 23d street, New York, was elected a regular member.

Walter B. Price, of 26 Broadway, New York, was proposed ·for membership.

The following paper was then read :

Chemical, experimental, and biological inquiries in connection with the present and proposed future water supply of the city of Albany, by Albert R. Leeds, Ph. D.

The following papers were announced for the next meeting on January 8th, 1886 :

Report of Committee on Nomenclature.

A Platinum Filter for Filtration on Dr. Carmichael's Plan ; by P. Casamajor.

Some contributions to the Study of New York City Water ; by A. A. Breneman, S. B.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

A CHEMICAL, BIOLOGICAL AND EXPERIMENTAL IN-QUIRY INTO THE PRESENT AND PROPOSED FUTURE WATER SUPPLY OF THE CITY OF ALBANY.

By Dr. Albert R. Leeds.

In the Spring of the present year, the Legislature of the State of New York was moved, by the frequent outbursts of popular indignation in Albany, with regard to the quality of its water supply, to create a Special Water Commission. And, inasmuch, as the investigations which I found necessary to make, as chemist to this commission, caused me to travel over certain new ground, I have thought it might prove of interest to the profession to put certain of the results on record in this journal. Fortunately the wording of the Act appointing the commission not only gave, but also encouraged considerable latitude of inquiry, for it directed that two objects should be kept in view :—

1st. Due inquiry into the available sources of supply of pure and wholesome water.

2d. If the present water supply proved on investigation to be the best available, then as to what, if any, method could be adopted for its improvement, or if possible, its purification.

In the conduct of the first branch of the investigation, I had occasion to examine the following possible sources of supply :—

1st. Certain lakes and water courses east of the Hudson, but in the immediate vicinity of Albany.

2d. Driven wells on the hills west of Albany, and driven wells located upon the flats lying along the river, north and south of the city.

3d. Various points upon the Hudson River, such as Waterford, situated above the influx of sewage from the city of Troy, and as many other points between Troy and Albany as would be necessary to investigate the question of the self-purification of the stream and the advisability of shifting the location of the mouth of the intake of the present pumping station to such other point as might be shown to afford better water.

4th. The Mohawk River above and below the falls.

With regard to the second branch of the inquiry, I was authorized by the commission to institute experiments upon the relative advantages of the following methods :—

1st. Purification by artificial oxidation by gaseous oxidants, and more specially oxygen, air and ozone, at ordinary atmospheric pressures and temperatures, or at increased pressures and temperatures.

2d. Purification by the use of solid substances, acting either as oxidants or precipitants or both.

3d. Combinations of the two preceding, in various orders and under various conditions of temperature and pressure.

4th. Purification by natural and artificial filtration, according to the many methods either hitherto in use, or such as might prove themselves peculiarly adapted to the environment of the Albany water supply.

5th. Combinations of the first three, or purification proper, with the fourth, the object being primarily to render innocuous noxious matter, both such as exists diffused in a state of solution, and particulate in the form of micro organisms ; and secondarily, to remove the *débris* of this noxious matter, and all suspended substances as well, by effective filtration.

In the conduct of the experiments falling under the five heads above enumerated, I was prevented by the necessity of performing a great number of analyses upon the various proposed sources of supply, and the limited time allowed by the Legislature to the commission before bringing in its final report, from prosecuting them to the desired point. I am able, therefore, to give only certain results in this place, and shall postpone the presentation of the remainder until they are worked out in connection with the proposed new water supply of the city of Philadelphia.

The methods of investigation made use of in connection with the Albany water supply, might be summarized under three classes :

A. Analytical.
B. Experimental.
C. Biological.

I. Analytical Data.

The analytical data established in the case of each sample, were the free and albuminoid ammonia, the nitrous and nitric acid, the oxygen required to oxidize organic matters as determined by permanganate at the boiling paint, and also by means of photo-chemical measurement, chlorine, hardness, total solids dried at 110°, fixed matter at low redness, volatile matter at low redness, and the dissolved oxygen, carbon dioxide, and nitrogen gases.

The nitric acid was determined by reduction to nitric oxide and endiometric measurement of the evolved gas. The original method for photo-chemical measurement of the oxygen required to oxidize organic matter, as stated in *The Philosophical Magazine*, has been modified in its application to more than 500 samples of waters, and the improved method and results I hope to find leisure to communicate in a subsequent article, together with the apparatus employed for the endiometric measurement of dissolved gases.

In the five tables which follow, are given :

I. A comparison of the waters of certain lakes and streams of the hill country east of the Hudson River, with the water taken from the Hudson at the present Albany pumping station. This comparison was made in deference to the opinions of those who thought that waters taken from elevated points in a mountainous district must necessarily be purer than that taken from a great stream flowing at a lower level.

II. Comparison of the water from a number of driven wells located on the hills west of Albany, and upon the alluvial flats lying along the Hudson River immediately north of the city, with the waters of the Hudson River.

III. A comparison of the waters of the Hudson River itself from a point above the influx of the sewage of Troy to the Albany pumping station, a distance of about seven miles.

IV. A comparison of the waters of the Mohawk River above and below the falls with those of the Hudson River taken directly at the intake, as delivered directly from the faucet at the City Hall, and as delivered from a commercial sand and charcoal filter located at the same point.

V. A comparison of the mineral constituents in the waters taken from two mountain lakes, a mountain stream, and a driven well in the hill country, with the waters of the Hudson River and the Mohawk River.

TABLE I.—LAKES IN RENSSELAER COUNTY WITH ALBANY PUMPING STATION FOR COMPARISON.

	896 I.	897 II.	888 III.	889 IV.	890 V.	887 VI.
Laboratory Number / Special Number						
Location	Snyder's Lake—Middle.	Sand Lake—Middle.	Poestenkill River at East Poestenkill.	Dyking Pond.	Pump-well of Pumping Station at Albany.	Pump-well of Pumping Station at Albany.
Date	Sept. 4th.	Sept. 4th.	Sept. 4th.	Sept. 5th.	Sept. 5th.	Sept. 16th.
Color	0	0	1.25	1.75	4.00	2.00
Taste	Earthy.	Slight.	Peaty.	Slightly marshy.	Pleasant.	Pleasant.
Smell	None.	None.	Peaty.	None.	Faint.	Slight.
FREE AMMONIA—						
Parts per 100,000	0.002	0.009	0.011	0.014	0.004	0.011
Grains per gallon	0.0012	0.0052	0.0064	0.0082	0.0023	0.0064
ALBUMINOID AMMONIA—						
Parts per 100,000	0.037	0.029	0.032	0.026	0.019	0.023
Grains per gallon	0.0215	0.0169	0.0186	0.0152	0.0111	0.0134
NITROUS ACID—						
Parts per 100,000	None.	None.	None.	Trace.	Trace.	None.
Grains per gallon	None.	None.	None.	Trace.	Trace.	None.
NITRIC ACID—						
Parts per 100,000	0.147	0.189	0.27	0.90	0.147	0.09
Grains per gallon	0.057	0.11	0.157	0.524	0.0857	0.052
OXYGEN REQUIRED TO OXIDIZE ORGANIC MATTERS [PERMANGANATE]—						
Parts per 100,000	0.32	0.25	1.90	0.60	1.20	0.74
Grain per gallon	0.1896	0.145	1.108	0.35	0.70	0.43
OXYGEN REQUIRED TO OXIDIZE ORGANIC MATTERS [SILVER]—						
Parts per 100,000	0.40	0.32	0.85	0.75	0.56	0.523
Grains per gallon	0.283	0.187	0.496	0.437	0.326	0.304
CHLORINE—						
Parts per 100,000	0.30	0.21	0.34	0.34	0.35	0.375
Grains per gallon	0.175	0.122	0.198	0.198	0.204	0.218
HARDNESS—						
Parts per 100,000	3.7	2.3	1.80	2.50	4.8	4.7
Grains per gallon	2.15	1.34	1.05	1.45	2.8	2.74
TOTAL SOLIDS—						
Parts per 100,000	7.40	3.7	5.5	0.90	10.7	11.0
Grains per gallon	4.315	2.157	3.2	4.02	6.23	6.41
MINERAL MATTER—						
Parts per 100,000	3.70	2.0	1.5	1.60	7.9	7.0
Grains per gallon	2.157	1.166	0.874	0.938	4.6	4.08
ORGANIC AND VOLATILE MATTER—						
Parts per 100,000	3.70	1.70	4.0	5.3	2.8	4.0
Grains per gallon	2.157	0.99	2.33	3.00	1.63	2.33
DISSOLVED GASES BY VOLUME—						
Oxygen, cubic centimeters per liter	5.02	5.57	5.55	3.94	5.24	3.93
Carbonic dioxide, cubic centimeters per liter	1.48	1.61	0.95	6.56	1.20	2.72
Nitrogen	12.20	12.02	12.59	12.08	12.32	12.38
Total Gases, cubic centimeters per liter	18.70	19.20	19.00	22.54	18.76	19.07

TABLE II.—DRIVEN WELLS WITH ALBANY PUMPING STATION FOR COMPARISON.

	VII.	VIII.	IX.	X.	XI.	XII.
Laboratory Number. Special Number.	883	868	869	871	872	870
Location	Well on Biessing Farm.	Well No. 1 on Three Hill Farm	Well No. 2, on Three Hill Farm	Well on Flats, Troy Road.	Well No. 5, on Dr. T. Helmes' Farm.	Pump Well of Alb'ny Pumping Station.
Date	Sept. 17th.	Oct. 19th.	Oct. 19th.	Oct. 29th.	Oct. 19th.	Oct. 19th.
Color	0.5	0.25	0	2.0	0	2.0
Taste	Unpleasant.	Pleasant.	Pleasant.	Pleasant.	Pleasant.	Pleasant.
Smell	None.	None.	Slightly vegtble	Slightly Unplnt	None.	Slightly Unplnt
Free Ammonia—						
Parts per 100,000	0.013	0.012	0.017	0.002	0.024	0.004
Grains per gallon	0.0076	0.007	0.01	0.0012	0.014	0.0023
Albuminoid Ammonia—						
Parts per 100,000	0.011	0.015	0.01	0.011	0.01	0.017
Grains per gallon	0.0064	0.0087	0.0058	0.0064	0.0058	0.01
Nitrous Acid—						
Parts per 100,000	None.	None.	None.	None.	None.	None.
Grains per gallon	None.	None.	None.	None.	None.	None.
Nitric Acid—						
Parts per 100,000	0.50	0.09	0.09	0.088	0.1	0.15
Grains per gallon	0.1166	0.052	0.052	0.0512	0.058	0.087
Oxygen Required to Oxydize Organic Matter [Permanganate]—						
Parts per 100,000	0.034	0.15	0.095	0.12	0.10	0.71
Grains per gallon	0.0198	0.087	0.055	0.07	0.058	0.41
Oxygen Required to Oxydize Organic Matter [Silver]—						
Parts per 100,000	0.523	0.41	0.52	0.37	0.56	0.57
Grains per gallon	0.304	0.238	0.302	0.215	0.326	0.332
Chlorine—						
Parts per 100,000	2.95	3.0	3.25	0.525	2.000	5.25
Grains per gallon	1.72	1.75	1.90	0.305	1.166	3.05
Hardness—						
Parts per 100,000	10.30	11.0	11.10	11.95	2.50	8.29
Grains per gallon	6.00	6.41	6.45	6.96	1.45	4.88
Total Solids—						
Parts per 100,000	20.9	20.25	21.3	22.9	19.5	12.0
Grains per gallon	12.18	11.81	12.4	13.4	11.37	7.0
Mineral Matter—						
Parts per 100,000	18.0	17.5	18.0	20.6	18.3	9.0
Grains per gallon	10.5	10.2	10.5	12.0	10.6	5.24
Organic and Volatile Matter—						
Parts per 100,000	2.9	2.75	3.3	2.3	1.2	3.0
Grains per gallon	1.69	1.60	1.92	1.34	0.7	1.75
Dissolved Gases by Volume—						
Oxygen, cubic centimeters per liter	4.17	2.53	2.79	3.05	2.44	4.45
Carbon dioxide, cubic centimeters per liter	1.54	1.14	1.09	4.18	4.40	2.28
Nitrogen	12.54	14.95	16.26	19.50	15.75	12.92
T Gases, cubic centimeters per liter	18.25	18.62	20.14	26.73	22.59	19.65

TABLE III.—HUDSON RIVER FROM WATERFORD, ABOVE TROY, TO ALBANY PUMPING STATION.

	850 XIII.	851 XIV.	852 XV.	853 XVI.	854 XVII.	855 XVIII.	857 XIX.	858 XX.
Laboratory Number	850	851	852	853	854	855	857	858
Special Number	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.
Location	Waterford, middle of river, 2 feet below surface.	Troy Pumping Station, 2 feet below surface.	River one mile below Troy (opposite Roy's Factory), 6 feet below surface.	River two miles below Troy (opposite Catholic Church), 6 feet below surface.	River three miles below Troy (above Pleasure Island), 6 feet below surface.	1,400 feet above Albany Intake (opposite Forbes Mansion), 6 feet below surface.	1,400 feet above Albany Intake (opposite Forbes Mansion), 6 feet below surface.	Intake of Albany Pumping Station, 6 feet below surface.
Date	Sept. 29th.	Sept. 29th.	Sept. 29th.	Sept. 29th.	Sept. 29th.	Sept. 29th.	Sept. 29th.	Sept. 29th.
Color	1.0	1.25	1.25	1.0	1.0	1.0	1.0	1.0
Taste	Slightly peaty.	Slightly peaty.	Slightly peaty.	Slightly peaty.	Peaty.	Slightly peaty.	Slightly peaty.	Slightly unplnt.
Smell	Slightly unplnt.	Slightly unplnt.	Slightly unplnt.	Slightly Unplnt.	Unpleasant.	Slightly unplnt.	Slightly unplnt.	"
FREE AMMONIA— Parts per 100,000	0.003	0.003	0.003	0.002	0.002	0.0025	0.0025	0.003
Grains per gallon	0.0018	0.0018	0.0018	0.0012	0.0012	0.0015	0.0015	0.0018
ALBUMINOID AMMONIA— Parts per 100,000	0.015	0.015	0.015	0.015	0.018	0.013	0.015	0.014
Grains per gallon	0.0087	0.0087	0.0087	0.0087	0.0105	0.0076	0.0087	0.0082
NITROUS ACID— Parts per 100,000	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.
Grains per gallon	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.
NITRIC ACID— Parts per 100,000	0.13	0.13	0.13	0.12	0.13	0.13	0.10	0.13
Grains per gallon	0.0758	0.0758	0.0758	0.0758	0.0758	0.0758	0.058	0.0758
OXYGEN REQUIRED TO OXIDIZE ORGANIC MATTER—[PERMANGANATE]— Parts per 100,000	0.47	0.47	0.41	0.445	0.445	0.477	0.47	0.477
Grains per gallon	0.274	0.278	0.24	0.259	0.259	0.278	0.274	0.278
CHLORINE— Parts per 100,000	0.425	0.450	0.475	0.450	0.500	0.475	0.475	0.500
Grains per gallon	0.247	0.262	0.277	0.262	0.291	0.277	0.277	0.291
HARDNESS— Parts per 100,000	4.71	4.57	6.48	5.86	5.7	6.0	5.7	5.96
Grains per gallon	2.74	2.66	3.75	3.41	3.32	3.5	3.32	3.40
TOTAL SOLIDS— Parts per 100,000	9.4	8.8	10.8	11.90	10.7	10.7	11.7	10.60
Grains per gallon	5.48	5.13	6.3	6.98	6.23	6.23	6.83	6.18
MINERAL MATTER— Parts per 100,000	6.1	6.2	7.5	9.20	6.9	7.5	8.5	9.40
Grains per gallon	3.55	3.6	4.37	5.38	4.02	4.37	4.95	5.48
ORGANIC AND VOLATILE MATTER— Parts per 100,000	3.3	2.6	3.3	2.70	3.8	3.2	3.2	1.90
Grains per gallon	1.92	1.51	1.92	1.57	2.2	1.9	1.9	0.70
DISSOLVED GASES BY VOLUME— Oxygen, cub. centimeters per liter	1.86	3.7	3.84	4.31	....	4.02	8.93	4.50
Carbon dioxide " " "	1.97	0.74	1.31	2.06	....	1.49	1.12	0.87
Nitrogen " " "	12.02	13.14	17.05	11.15	....	11.87	11.40	14.08
Tot. Gases, cub. centim. per liter.	15.85	17.88	21.60	17.54		17.08	16.45	19.90

TABLE IV.—MOHAWK RIVER, DRIVEN WELL, AND HUDSON RIVER, FILTERED AND UNFILTERED.

	884. XXI.	886. XXII.	888. XXIII.	889. XXIV.	888. XXV.	897. XXVI.	885. XXVII.
Laboratory Number / Special Number							
Location	Mohawk Rvr. above Falls.	Mohawk Rvr. below Falls.	Hudson Rvr. Waterford.	Albany Intake.	Albany City Hall(unfiltrd.)	Albany City Hall (filtered).	Greenbush Flats, Driven Well, No. 1.
Date	Oct. 30th.	Oct. 30th.	Oct. 31st.	Oct. 31st.	Oct. 30th.	Oct. 30th.	Oct. 31st.
Color	4.5 Very turbid.	4.5 Slightly peaty	5. Very turbid	Very turbid	2.0	0.	0.
Taste	Pleasant.	Trace.	Slightly unpl.	Slightly unpl.	Pleasant.	Slightly unpl.	Pleasant.
Smell	Marshy.	None.	Vegetable.	Vegetable.	Vegetable.	None.	Slightly unpl.
FREE AMMONIA—							
Parts per 100,000	0.005	0.005	0.0005	0.0115	0.005	0.0055	0.0055
Grains per gallon	0.0029	0.0029	0.0088	0.0067	0.0029	0.0082	0.0082
ALBUMINOID AMMONIA—							
Parts per 100,000	0.018	0.016	0.02	0.021	0.0155	0.011	0.028
Grains per gallon	0.0103	0.0093	0.0117	0.0122	0.009	0.0064	0.0168
NITROUS ACID—							
Parts per 100,000	Trace.	Trace.	None.	None.	None.	0.0082	Trace.
Grains per gallon	Trace.	Trace.	None.	None.	None.	0.0019	Trace.
NITRIC ACID—							
Parts per 100,000	0.50	0.45	0.05	0.10	0.05	0.05	0.12
Grains per gallon	0.29	0.26	0.029	0.058	0.029	0.029	0.07
OXYGEN REQUIRED TO OXIDIZE ORGANIC MATTERS [PERMANGANATE]—							
Parts per 100,000	0.58	0.56	0.72	0.70	0.63	0.12	0.08
Grains per gallon	0.338	0.326	0.42	0.408	0.367	0.07	0.047
CHLORINE—							
Parts per 100,000	0.50	0.50	0.375	0.45	0.50	0.60	6.95
Grains per gallon	0.291	0.291	0.218	0.262	0.291	0.35	4.05
HARDNESS—							
Parts per 100,000	8.4	7.6	4.4	6.3	6.4	6.9	2.7
Grains per gallon	4.9	4.43	2.57	3.67	3.73	4.02	1.57
TOTAL SOLIDS—							
Parts per 100,000	16.8	12.7	7.9	18.1	1.8	0.5	32.6
Grains per gallon	9.79	7.4	4.6	7.59	6.98	5.54	19.01
MINERAL MATTER—							
Parts per 100,000	11.5	9.2	4.6	10.1	7.9	6.5	30.8
Grains per gallon	6.7	5.36	2.68	5.84	4.6	3.79	17.6
ORGANIC AND VOLATILE MATTER—							
Parts per 100,000	5.3	3.5	3.3	3.0	3.9	3.0	2.8
Grains per gallon	3.09	2.01	1.92	1.75	2.28	1.75	1.41
DISSOLVED GASES BY VOLUME—							
Oxygen dissolved in 1 liter	3.07	3.95	3.53	4.24	8.90	2.86	2.25
Carbonic Acid " "	2.82	1.72	1.44	1.60	2.90	2.97	3.34
Nitrogen " "	18.18	13.56	15.81	14.13	17.10	18.60	22.16
Total Gases dissolved in 1 liter	24.07	19.25	20.84	19.97	28.90	24.43	27.96

TABLE V.—ANALYSES OF MINERAL CONSTITUENTS.

	886 I. Snyder's Lake, Middle. September 4th.		827 II. Sand Lake, Middle. September 4th.		888 III. Poestenkill Riv. at E. Poestenkill. September 4th.		890 V. Pumping Well of Alb'ny Pumping Station. September 5th.		872 XI. Dr. Helmes' Farm.		¼ of 884 & ⅓ of 886 ⅓ of XXII. & ½ of 890 Mohawk River, above and below Falls.	
Laboratory Number / Special Number	Parts pr 100,000	Grs. pr gal.	Parts pr 100,000	Grs. pr gal.	Parts pr 100,000	Grs. per gal.	Parts pr 100,000	Grs. per gal.	Parts pr 100,000	Grs. per gal.	Parts pr 100,000	Grs. per gal.
Silicic Anhydride	0.220	0.128	0.090	0.052	0.550	0.321	0.440	0.257	0.680	0.513	1.580	0.921
Phosphoric anhydride			0.007	0.004	0.010	0.006	0.040	0.023				
Sulphuric Anhydride	0.440	0.256	0.380	0.222	0.100	0.063	0.650	0.379	0.590	0.344	1.370	0.799
Carbon Dioxide	1.550	0.916	0.440	0.257	0.160	0.093	2.648	1.545	5.310	3.097	2.030	1.184
Chlorine	0.300	0.175	0.210	0.122	0.340	0.198	0.340	0.198	2.080	1.219	0.500	0.292
Potassium Monoxide	0.040	0.023	0.070	0.041			0.080	0.047	Trace.	Trace.		
Sodium Monoxide	0.800	0.467	0.280	0.163	0.220	0.128	0.430	0.251	6.340	3.697	0.970	0.566
Magnesium Oxide	0.180	0.105	0.020	0.011	0.003	0.002	0.320	0.187	1.120	0.653	0.330	0.192
Calcium Oxide	1.440	0.840	0.620	0.362	0.300	0.175	3.000	1.784	1.520	0.882	2.610	1.524
Aluminium Oxide			0.006	0.003	0.060	0.052	0.030	0.017				
Ferric Oxide	0.100	0.058	0.064	0.037			0.310	0.181	0.490	0.296	0.730	0.426
Deduct Oxygen for Combined Chlorine	5.090 0.210	2.968 0.122	2.187 0.080	1.274 0.047	1.763 0.050	1.027 0.029	8.348 0.120	4.860 0.070	18.350 0.470	10.701 0.273	10.120 0.110	5.902 0.064
Mineral Matters	4.880	2.846	2.107	1.227	1.713	0.998	8.228	4.790	17.880	10.428	10.010	5.888
Organic Matters	1.890	1.102	1.360	0.793	1.229	0.717	4.178	2.438	4.020	2.344	3.200	1.866
Total Solids in Solution	6.770	3.948	3.467	2.020	2.942	1.715	12.406	7.237	21.900	12.772	13.210	7.704
Silicic Anhydride	0.223	0.128	0.080	0.048	0.550	0.321	0.440	0.257	0.880	0.513	1.580	0.921
Potassium Sulphate	0.080	0.047	0.130	0.070			0.150	0.087	Trace.	Trace.		
Chloride									Trace.	Trace.		
Sodium Carbonate	0.470	0.274	0.250	0.134	0.410	0.239	0.310	0.181	0.980	4.041	1.290	0.500
Sulphate	0.600	0.350	0.350	0.204	0.010	0.006	0.560	0.326	1.060	0.617	0.830	0.478
Chloride	0.410	0.286	0.050	0.029	0.200	0.117	0.670	0.391	3.450	2.012	0.700	0.408
Magnesium Carbonate	0.400	0.233	0.520	0.303	0.280	0.163	4.970	2.896	2.350	1.371	3.780	2.204
Calcium Carbonate	2.550	1.499	0.340	0.198	0.150	0.087	0.640	0.397	2.720	1.587	1.210	0.705
Sulphate					0.020	0.012						
Chloride					0.080	0.047						
Aluminium Phosphate			0.013	0.007			0.050	0.040				
Oxide												
Ferric Oxide	0.100	0.058	0.064	0.037			0.310	0.181	0.490	0.296	0.730	0.426
Mineral Matters in Solution	4.930	2.875	2.107	1.280	1.700	0.992	8.160	4.758	17.880	10.428	10.020	5.858
Organic Matters	1.890	1.102	1.360	0.793	1.230	0.717	4.178	2.438	4.020	2.344	3.200	1.866
Total Solids												

I insert the accompanying five tables, partly to render intelligible what follows, and partly because the results are not in accordance either with the preconceived ideas of the inhabitants of Albany, or with the anticipations of the members of the Special Commission, the engineers in charge, or my own.

For, in the first place, the samples taken from the mountain lakes and streams do not compare favorably with the sample taken from the Hudson at the same date. It will be found by reference to Table I., that the albuminoid ammonia in the samples from Snyder's Lake, Sand Lake, Poestenkill River, and Dykeing Pond is greater than at the Albany pumping station, and the free ammonia is likewise greater, except in the case of Snyder's Lake. The required oxygen for the Poestenkill is enormous, as also the nitric acid of the Dykeing Pond. I conclude from the latter fact that the water in this pond contained, prior to the time of the analysis, an even larger percentage of decomposable nitrogenous matter than is indicated by its albuminoid ammonia. In other words, a large amount had been destroyed by natural processes of oxidation, and had been converted into nitric acid. The evidence of this oxidizing action is still further shown in the percentage of carbon dioxide in the Dykeing Pond sample, amounting to the very unusual volume of 6.56 c.c. per liter. The quantitative measurement of the color, which is of a yellow to reddish-yellow tint, in the two samples just alluded to, gives 1.25 and 1.75 respectively. This color is a stain due to coloring matters of peaty origin in solution, and is accompanied by a rise in the amounts of required oxygen to 1.90 and 0.60. The quantitative measurement of color in this way becomes an index of the oxidizable organic matter. The same fact is illustrated by a comparison of the waters of the Hudson taken Sept. 5th and 16th, but, in addition, these two samples expose the fallacy of an opinion popularly prevalent concerning river waters. For the first was taken immediately on resumption of pumping after an interval of four days, during which interval the river had been rendered so yellow and turbid by recent rains, that the engineers had regarded it unfit to drink. As a matter of fact, its ammonia yielding constituents had been diminished. And the same water on keeping in the laboratory [storage and sedimentation], became of a high order of purity, most of the micro-organisms either dying, or being precipitated as resting spores along with the sediment. In

the reports on the proposed new water supplies of Wilmington, Del., and Philadelphia, numerous illustrations are given of the action of suspended aluminous matter [mud], in removing the ammonia-yielding organic constituents of the water.

In this connection, the beneficial effects of recent rains in raising the percentage of the dissolved oxygen should likewise be noted. This dissolved oxygen after a time is used up in oxidizing dissolved organic impurities, the percentage of carbon dioxide at the same time rising. Furthermore, as will be seen by reference to the Dykeing Pond sample, in proportion as the organic nitrogen becomes converted into nitric acid, the oxygen essential to this process is used up, and the percentage of dissolved oxygen exhibits a correspondingly low figure.

The analyses summarized in Table III. are of interest, both as relates to the potability of sewage-polluted water, like the Hudson River at Troy and Albany, and also in relation to the question of the self-purification of a flowing stream.

It will be seen that the absolute amount of free ammonia is very small, being only 0.003 per 100,000, in four of the samples, and even less in the remaining four. The albuminoid ammonia is also moderate in amount, being less in the Waterford sample than it is in that taken at the Albany pumping station, Sept. 5th, which sample, as we have just seen, contains a smaller quantity than is present in any of the lakes of Rensselaer County. The percentage of albuminoid ammonia in the Waterford sample is the same as that present at the Troy pumping station, and also at one and at two miles below Troy. Three miles below it rises sharply in amount, an increase due unquestionably to considerable local contamination near the point where the sample was drawn from the river. But it falls again at the point 1,400 feet above the Albany intake, the sample collected on the ebb tide having less putrescible organic matters than were present in any of the eight samples taken from the Hudson at this time. At the intake itself the albuminoid ammonia is 0.014 parts per 100,000, as against 0.015 parts at Waterford, Troy, and at one and two miles below.

One mile below Troy, the amount of oxygen requisite to effect the oxidation of the organic matters is less than at Waterford, which is situated on the Hudson some distance above Troy, and entirely above and beyond the influence of the Troy sewage. And

although at certain intermediate points it again increases by
organic matters locally added at these points, it does not exceed,
even at the Albany intake, its amount at the Troy intake. The
chlorine increases in the seven miles from Waterford to the Albany
intake. This increment is a rational one, since it applies to a
mineral constituent of sewage, and not to a constituent capable,
like the matters above alluded to, of progressive oxidation.

All the Hudson River samples exhibit traces of nitrous acid, a
very important fact, showing the reality of the existence of recent
sewage contamination at every point examined. The nitric acid is
the same, namely, 0.13 parts of 100,000 in all the samples taken on
the ebb tide. It is notably less than the one sample taken on the
flood, a result probably due to the reduction of the nitrates in
contact with the fresh sewage sweeping upward past the Albany
docks.

The minimum amount of dissolved oxygen is at one mile below
Troy, at which point the oxygen has been exhausted by contact
with the fresh sewage, and where it has had no opportunity to
increase, as it does in the further run down the river.

Passing now to Table II., it will be seen that the free ammonia
is much greater in the driven well than in the surface water, whilst
the albuminoid ammonia is less. I attribute this result to the
oxidation occurring in the pores of the ground, through which the
meteoric waters filter before reaching the gravel stratum out of
which they rise. In consequence of this oxidizing action, the
nitrogenous matters are decomposed, and pass out of the putrescible
condition in which they yield albuminoid ammonia, into the more
stable form in which they yield free ammonia.

The chlorine in the wells is immensely greater than in the surface
waters, but this chlorine is not indicative of infiltration of sewage,
but is connected with a simultaneous large increase of all the
mineral constituents due to the solution of mineral substances by
the waters in the course of their filtration through the ground.

When we come to the dissolved gases, we find corresponding
differences in the percentages of oxygen, due to the oxidizing action
alluded to above, and inseparabiy connected with any process of
beneficial filtration, whether it be effected by natural or by artificial
means. The gases held in solution in superficial ground waters
are principally derived from the atmospheric air with which these

waters are in contact, both superficially and in the interstices of the
soil. Such being the case, we can readily understand why the air
dissolved in the driven well samples is impoverished in respect of
its oxygen, and why it contains a relatively larger amount of
nitrogen. The carbon dioxide generated by oxidation processes,
rarely remains permanently in solution, being used up by plant
organisms for their food, or seized upon by lime and other bases to
form mineral carbonates.

Table No. IV. presents in the first place a comparison of a
specimen taken from the Mohawk River above the Falls, with one
taken below the Falls, on the same day. They are both, like those
taken from the Hudson River at Waterford and at the Albany In-
take, very turbid and deeply yellow colored. That taken above
the Falls, like the one from the intake, is so muddy and opaque that
its color could not be qualitively estimated by means of the color-
meter. In taste, both the Mohawk samples were better than those
from the Hudson, that taken from above the Falls being the only
one entirely agreeable in flavor.

In respect of free and albuminoid ammonia and of oxygen re-
quired to oxidize organic matters, they were superior in quality to
the Hudson River samples : in respect of chlorine, hardness and
total organic and volatile matters, they were inferior. I am at an
entire loss to know, not having personally visited the spot and col-
lected these samples, why the sample taken below the Falls was
on the whole of better quality than that taken above. I can only
infer, from the increased percentage of the dissolved oxygen gas
and the simultaneous diminution of the albuminoid ammonia and
of the oxygen required in the laboratory to effect the oxidation of
the organic substances in the two waters, that in their passage over
the Falls a notable aeration and improvement had been brought
about. Simultaneously with this change, a process of subsidence
and precipitation in the river below the Falls appears to have taken
place, by which means the mineral matters and the hardness under-
went a very considerable diminution. But, notwithstanding this
improvement, I do not think the difference in quality is sufficiently
in favor of the Mohawk to warrant a recommendation to transfer
the source of supply to this river. This view is much strengthened
by the fact that the Mohawk is a harder water than the Hudson,
and the difference in this respect would result in a considerable

pecuniary loss to those engaged in manufacturing operations, and
to the population at large in relation to its laundry use.

Proceeding now to the samples taken directly from the Hudson,
October 21st, we note that in their physical properties the samples
taken at Waterford and at Albany exhibit the same characteristics,
being both dark colored, very turbid, and of slightly unpleasant
taste. They show in a most striking manner an increase in the
permanent mineral constituents, along with little corresponding
change (and in regard to two classes of results even a diminution)
in their organic constituents. For, at Waterford, the chlorine is
0.375 parts per 100,000, while at Albany it has increased to 0.45
parts ; at Waterford the hardness is 4.4, at Albany 6.3 ; at Water-
ford the total solids and mineral matters are 7.9 and 4.6, respect-
ively, as against 13.1 and 10.1 parts at the Intake of the Albany
station. Referring now to the organic constituents, we see that
the free ammonia at Albany is nearly double what it is at Water-
ford, whilst the measure of the nitrogenous impurities themselves
has increased by only 0.001 part. The oxygen required to effect
the oxidation of the organic matters is 0.02 parts less at Albany than
at Waterford, and the total organic and volatile matters are 0.3
part less. Along with this progressive oxidation, there is an in-
crease in the percentage of carbon dioxide originating from it.

A comparison of the water running from the faucet of the City
Hall, before and after filtration, shows that an improvement has
thereby been effected. The improvement is most striking in the
oxygen required to oxidize the organic matters of which only 0.12
parts were required for the filtered as against 0.63 for the unfiltered.
The total organic matters for the filtered is 3 parts as against 3.9
parts for the unfiltered. But, during the process of filtration, the
oxygen dissolved in the water has been used up, and in its place we
find an increased quantity of carbon dioxide. Not only is the
filtered water very poor in oxygen, but it contains a measurable
amount of nitrous acid, which is present in waters only when the
average matters which they contain have undergone incomplete
oxidation.

BIOLOGICAL ANALYSIS.

No biological analyses were made of the Rensselaer County
waters, my arrangements for this part of the work not having been

completed. The ten duplicate specimens taken from the Hudson
River, between Waterford and Albany, September 29th, showed
the following results : At the end of 48 hours, the culture tubes
pertaining to all the specimens were unchanged. At the end of five
days the gelatine in the culture tube belonging to the specimen col-
lected opposite to Roy's factory was entirely liquefied ; that in all
the other culture tubes almost entirely liquefied. The number of
microbes was greatest in the culture tube belonging to the specimen
taken three miles below Troy, and least in the culture tubes of
those specimens from the Albany and Troy intakes. Judging from
the results of the biological analysis, the water collected at the
Albany intake certainly did not contain more microbes than that
from the Troy intake. These two waters were the best. The
samples from Waterford were inferior to the two preceding, and
of the three Waterford samples themselves, that from the east shore
was the best, that from the middle the worst. The latter indeed
was no better than the sample taken 1,400 feet above the Albany
intake. In the following table I have arranged this set of Hudson
River samples in two series, in one of which they are ordered in
accordance with their excellence as decided upon chemical, in the
other upon biological grounds :

SERIES No. II., HUDSON RIVER SAMPLES, SEPT. 29TH.

A.—Chemical Order.	*B.—Biological Order.*
I. 1,400 ft. above Albany Pump-ing Station.	I. Albany Pumping Station, Troy Pumping Station.
II. Albany Pumping Station.	II. 1,400 feet above p. s., flood.
III. Waterford.	III. Two miles below Troy.
IV. Troy Pumping Station.	IV. One mile below Troy.
V. One mile below Troy.	V. Waterford.
VI. Two miles below Troy.	VI. 1,400 ft. above p. s., ebb.
VII. 1,400 ft. above Albany Pump-ing Station, flood.	VII. Three miles below Troy.
VIII. Three miles below Troy.	

In the biological analysis of the driven well samples, taken
October 19th, and the Albany pumping station of the same date,
the culture tubes of the former did not show any micro-organisms
until the ninth day, when they first made their appearance,
and finally brought about a liquefaction of the gelatine at
various dates from the tenth to the eighteenth day. The Troy

Flat sample of this date presented similar characteristics, and underwent liquefaction in the same interval of time as the samples from the Three Hills and Dr. Helme's farm. The Albany sample exhibited organisms on the first day, began to liquefy at the expiration of sixty hours, and completely broke down on the third day with the appearance of very numerous microbes.

In the biological examination of the fourth series, the water taken from the Greenbush Flats driven well, No. 1, developed most microbes; that from the Mohawk River, below the Falls, the next largest number; that from the Albany intake followed third; that of the Albany City water, after filtering, fourth, before filtering, fifth; above the Mohawk Falls, sixth, and that from Waterford, last. Or, to rate them according to their purity, from a biological standpoint (though none of them were by any means free from microbes), their order would be as follows, the corresponding order on chemical grounds being added for comparison :

SERIES IV., FROM MOHAWK AND HUDSON, OCT. 30TH.

A.—Chemical Order.	B.—Biolog'cal Order.
I. Albany City Hall (filtered).	I. Waterford.
II. " " (unfiltered).	II. Mohawk River, above Falls.
III. Mohawk River, below Falls.	III. Albany water, before filtering.
IV. " " above "	IV. " " after "
V. Hudson River at Waterford.	V. Albany intake.
VI. " " Albany.	VI. Mohawk River, below Falls.
VII. Greenbush Flats, driven well.	VII. Greenbush Flats, driven well.

EXPERIMENTAL INVESTIGATION.

The analysis of the samples, before purified by oxidation processes and filtration in the manner previously indicated, will be found in the accompanying tables. My time allowed analysis of the purified samples only as far as the determination of the three most important factors free ammonia, albuminoid ammonia, and required oxygen. The results obtained were as follows :

PURIFACTION BY OXIDATION AND FILTRATION.

Snyder's Lake.

	Before Purification.	After Purification.
Free ammonia	0.002 pts. per 100,000	0.012 pt. per 100,000
Albuminoid ammonia	0.037 " "	0.012 " "

Sand Lake.

	Before Purification.	After Purification.
Free ammonia	0.009 pts. per 100,000	0.01 pt. per 100,000
Albuminoid ammonia	0.029 " "	0.01 " "

Dykeing Pond.

	Before Purification.	After Purification.
Free ammonia	0.014 pts. per 100,000	0.01 pt. per 100,000
Albuminoid ammonia	0.026 " "	0.012 pts. "
Required oxygen	0.60 " "	0.214 " "

Poestenkill River.

	Before Purification.	After Purification.
Free ammonia	0.011 pts. per 100,000	0.011 pts. per 100,000
Albuminoid ammonia	0.032 " "	0.0115 " "
Required oxygen	1.90 " "	0.88 " "

Albany Pumping Station, Sept. 5th.

	Before Purification.	After Purification.
Free ammonia	0.004 pts. per 100,000	0.01 pt. per 100,000
Albuminoid ammonia	0.019 " "	0.008 pts. "
Required oxygen	1.20 " "	0.293 " "

The meaning of these figures is, that the putrescible matter, taking the albuminoid ammonia as its index, had been mostly removed, in one instance only 30 per cent. remaining of the 100 present in the original unpurified water. And furthermore, that the total organic matter, taking the oxygen required to oxydize it as an index had been still more perfectly removed, the purified Albany intake sample containing only 24 per cent. of the oxidizable organic substances originally present.

The free ammonia, derived as it is from nitrogenous bodies by processes of oxidation, was in most instances increased.

These surprising and very gratifying results were obtained by simple means in the laboratory, and there is no practical obstacle that I know of, to their economical application on the scale necessitated by the supply of a large city like Albany.

GENERAL COMPARISON OF RESULTS.

On a general survey of these results, there would appear to be no good reason why the waters from any one particular locality should be exalted above all the others, and in this manner the source of supply, so far as the vital question of purity is concerned, should be settled. Only by the critical weighing of many considerations

and by the exclusion of such sources as have previously been shown
to be inferior for reasons already given in the text, can the problem
be so narrowed down that its solution becomes feasible.

We should, therefore, begin by excluding the samples from
Rensselaer County ; the Mohawk River waters ; all the samples
from the Hudson River proper, except those from Waterford, Troy
pumping station, the Albany intake, and 1,400 feet above the in-
take.   Then, of those which remain, we shall begin by comparing
those taken from the Hudson River among themselves.   In the
first place, they are all alike in containing some unoxidized sewage.
It is present at Waterford, at Troy pumping station, and, although
undergoing a certain amount of oxidation on its way down the
river, it is neither at the Albany pumping station, nor 1,400 feet
above, so far eliminated that the water taken directly from the river
at the Albany intake is of sufficient purity for potable use.

We shall, therefore, exclude the Hudson River as taken *directly*
at any point, beginning at Waterford, down to Albany, from the
recommendable sources of future supply.

The case, however, is different with regard to the Hudson waters
subjected to processes of purification and filtration ; for, while the
particular sample of the Albany water filtered at the City Hall did
not afford satisfactory results, yet it is possible by simple and prac-
tical means to purify them thoroughly, so that they shall not con-
tain organic matters dangerous to health, nor organized particles,
in the form of germs, capable of originating disease.

With regard to the driven wells, the testimony concerning those
on the Troy Flats is conflicting, the earlier sample being satis-
factory from a chemical and biological standpoint, whilst the latter
sample was anomalous in both.   Although analyses are needed in
the future, to decide the cause of these anomalies, yet as far as an
opinion can be formed from the nature of the evidence now in my
possession, I believe them to be accidental, and that the water
taken from the driven wells on the Flats, would prove to be both
satisfactory for manufacturing use, and safe and wholesome for
domestic purposes.

The water from the driven wells at Dr. Helmes' farm contains
10.43 grains per gal., as against 4.76 grains in the Hudson River
water at Albany (see analysis of September 5th), but an examina-
tion of Table V., shows that these saline matters are not of a char-

acter to injure the water for manufacturing purposes, nor do they give other than an agreeable taste.

I would, therefore, include the water from this and the neighboring Three Hills farm, among those capable of supplying Albany with satisfactory and wholesome drinking water.

CONCLUSIONS.

Two classes of considerations must be kept in view in drawing these conclusions ; the one relating to the use of a city water supply for drinking and domestic purposes, and the other, which we can by no means afford to lose sight of, in view of the enormous pecuniary interests involved, its use for laundry and manufacturing purposes.

As to the first, no water is fit for drinking and domestic purposes, unless it is entirely odorless, colorless, perfectly pellucid and transparent ; free from turbidity and suspended particles ; of no taste, or, if any, a pleasant one, and demonstrably free from all non-organized or organized matters (in the shape of germs) capable of originating disease.

Now, it is no proof that these requirements are either unnecessary or exaggerated, that most of the cities in this country and the old world, are supplied by water which does not conform to them. Public opinion on these matters has developed aggressive strength only during the last few years, and indeed could not be formed on impregnable grounds except with the aid of the scientific discoveries of the past ten years. Now, that it has been demonstrated that the chief agency in the transmission of cholera, typhoid fever, and zymotic diseases in general, is by means of organized germs diffused in drinking water, the popular demand for sources of water supply demonstrably free from organic impurities is imperative, and legislatures and municipal authorities must obey it.

Whenever appealed to, the courts in this country have affirmed by decisions in conformity with very emphatic charges from the bench, that corporations and individuals could not abuse the waters of a flowing stream used for water supply, by emptying sewage into it. At the present time, the citizens of Albany are drinking a residual portion of the sewage of Troy, and a part of their own sewage. The citizens of Troy are consuming as a beverage some unoxidized sewage from points above them on the Hudson. It remains for legislative enactment and a humane and wise public

opinion to compel these and all other communities to reclaim their sewage, before emptying the effluent waters therefrom into a flowing stream. Simple, economical, and completely effectual methods for so doing, are now known and practiced by sanitary engineers.

But even granting that this is done, the consumer should have the water delivered to him in the limpid and demonstrably pure condition above spoken of. And under no conditions can he be guaranteed in the possession of such a water supply, unless it be thoroughly purified and filtered immediately before use. This can be done either artificially or naturally. The water taken from the driven wells at the Three Hills and Troy Flats farms, and that taken from the Hudson River at Albany and properly purified, are equally limpid, colorless, odorless, and free from micro-organisms of every description.

From a sanitary, a chemical, an experimental and a biological standpoint, I can affirm that either of these two modes of supply will afford the people of Albany equally pure and wholesome drinking water.

With regard to their use for manufacturing purposes, a somewhat similar statement can be made.

The driven well waters contain a considerably larger amount of mineral substances in solution than the river waters. But the detailed analyses given in Table V., show that this excess is due to an increase in the amount of the soda salts, and not to an increase in the amount of lime and magnesia salts. Did they exhibit an increase of the latter constituents, they would not be, as in fact they are, soft waters, and would not be adapted for laundry use. At the same time there would be an advantage in lowering the percentage of saline constituents in the driven well water, varying as they do, from 10 to 20 grains per gallon, by using it in connection with the river water, whose mineral constituents are about 4.5 grains.

For the various reasons detailed in the body of this report, I would finally recommend :

That the City of Albany should avail itself of the advantages and guarantees of a twofold system of water supply.

I. Hudson River water, purified and filtered.

II. Driven well water.

In case the former is adopted, I would further recommend :

1st. That the water should be taken above Albany, at some point above the influence of the Albany sewage, and when time and distance had been afforded to allow the maximum possible self-purification of the Troy sewage.

2d. That the water should not be taken directly from the river, but through a curb or well, arranged to exclude the surface water and the grosser organic and mineral impurities.

3d. That the water should be brought from the intake located in this well to the present pumping station, and from thence lifted to the reservoir.

4th. That it should be purified and filtered immediately before delivery into the reservoir.

In case the driven well system is adopted, I would recommend :

1st. That as much water should be drawn from the wells in the Three Hills farm tract as they are capable of affording ; and, in case they prove inadequate or it should appear desirable to extend the system,

2d. That the system should be extended to the Troy Flats.

3d. That the deficiency of oxygen in the driven well waters should be made up by charging them with air under pressure in the course of their transmission through the mains from the wells to the reservoir.

APPENDIX.

The above experimental inquiries are, for the reasons previously given, of a merely introductory character, but it is important to present, so far as I am acquainted with it, the history of this part of the subject. In the months of January and February, 1883, the water of the Schuylkill River became so nauseous in taste and smell that it was not potable, and I was requested by the water department of that city to examine into the origin of the malady. It was not revealed by the chemical analyses of the samples, although these analyses were extended to the determination of gaseous, mineral and organic constituents ; but, by experimental treatment in the laboratory, I found that the oxygen present in solution, which was abnormally low in the original samples taken from the Schuylkill river could be readily raised to its normal amount, and that I could effect a corresponding diminution in the amount of organic constituents. It was proposed that the percentages of

organic matters which could be eliminated, and more especially the nitrogenous organic matters, should be taken as indicating the indices or co-efficients of impurity ; and, similarly, the amounts of oxygen which had to be added were proposed as a measure of the inferiority of the samples examined below a feasible condition of purity.

The practical benefit of these experimental inquiries is daily experienced in the case of the water supply of Hoboken, which amounts to 4,000,000 gallons, and which for the past year and a half has had its deficiency of oxygen supplied by the injection of air under pressure, and a similar method of treatment was recommended, and is being introduced at the several pumping stations of the Philadelphia Water Department.

It is possible to obtain, by simple methods of laboratory experiment, an effectual purification of the samples submitted to analysis. This being the case, we are compelled to abandon the different standards of relative purity which have been our only reliance hitherto, and to substitute for them absolute hygienic standards. The former class of standards have frequently been deduced from the comparison of city water supplies of fair repute. It is obvious that such standards must necessarily be of a degraded character. Or, in place of general standards so established, particular standards have been proposed. For instance, the pollution of the water supplies of Newark and Jersey City is measured by the differences between the results obtained by analyses of the Passaic water at the pumping stations, and the waters of the same river before it has encountered sewage contamination. The composition of the waters at Phœnixville has been proposed as a standard of purity of the sewage polluted Schuylkill at the pumping stations of Philadelphia.

But it can be readily demonstrated by laboratory experiment that these standards themselves are usually questionable, their character breaking down on applying the severe tests of biological analysis, and a large co-efficient of removable impurities being obtained on the application of the purification processes above alluded to. Such being the case, let us set aside these questionable standards of general and particular relative purity, and replace them by what might be termed absolute hygienic standards. That is to say, let us determine what and how much of the organic con-

stituents of a water are eliminable by experimental laboratory puri-
fication. Let the fact of purification be established by biological
analysis, when, if the purification is such as it should be, and such
as is readily obtainable in the laboratory, biological analysis should
show the destruction of micro-organisms by the purification method
employed. Then let the character and analysis of the water thus
purified be set up for an absolute hygienic standard in the case of the
particular water experimented upon. How near, as a matter of chemi-
cal engineering, it may be desirable to realize in practice the supply
to a large city of water conforming to the laboratory standard, it is
foreign to the purpose of the present article to discuss. But it will
be readily seen that this experimental method of water analysis
supplies many facts of a practical nature, such as water commis-
sioners demand information upon, whilst chemical analysis, *per se*,
supplies such information only obscurely and inferentially. For
the reasons above given, it appears to me that experimental water
analysis affords the most promising field in connection with the sub-
ject of water supply.

In conclusion, I wish to state, in order to prevent my being mis-
understood, that the presence of non-pathogenic microbes in sewage-
polluted waters is of the greatest benefit, inasmuch as it is with the
aid of the transformations effected in connection with their vital
processes that oxygen is absorbed and the oxidation of decompo-
sable organic matter principally accomplished. Furthermore, they
antagonize and destroy the pathogenic bacteria, liable at all times
to be associated with sewage. Their study, as a factor in water
analysis, has been utilized for the reason that in proportion as sew-
age is oxidized with their aid, it disappears, and the diminution of
sewage, the exhaustion of the dissolved oxygen, and the develop-
ment of microbes, stand in definite relationship to one another.
Furthermore, as the sewage is destroyed, or in waters containing
no sewage, the microbes disappear for lack of favorable environ-
ment, and hence, even without determining what microbes in a
water under examination are pathogenic and which are not (a prob-
lem beset at the present time with extreme difficulties), it may
safely be set down that a water which is lacking both in sewage
constituents and in microbes in general, and especially when it con-
tains its normal percentage of oxygen, is hygienically pure.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

On the Alkaline Hydrates. E. J. MAUMENÉ.

An extended study of the hydrates of baryta, strontia, potash and soda.

In a previous paper on hydrates of baryta (presented to the *Acad. des Sciences*, June 11th, '83), it was shown that barium hydrate contains BaO 50%, HO 50%. The author denies in general the existence of monohydrates, whether acids or bases. Having fused the normal hydrate, containing 8.5 mols. of water, he does not obtain BaO HO but BaO (HO)$_{1.214}$. As to strontia, he concludes (Paper of January 21st, 1884, on strontium hydrate) that one hydrate is formed of one mol. of strontia and 9.583 mols. of water. He denies the existence of the hydrate SrO HO, but has found a normal hydrate SrO (HO)$_{0.881}$.

The normal hydrate of potassium oxide has been thought to be KO (HO)$_5$; Maumené establishes (Paper of October 20th, 1884), that the real hydrate is KO (HO)$_{5.22}$. This hydrate crystallizes; its solution in water is produced with absorption of heat. Another hydrate, obtained by the slow desiccation of the first, was found to be a definite hydrate KO (HO)$_{3.133}$. As for KO (HO) Maumené denies its existence. He obtained a well defined hydrate KO, (HO)$_{1.743}$; maintained for some time at a low red heat this became KO (HO)$_{1.207}$, and at a white heat KO (HO)$_{0.746}$. Similar facts are found in the case of sodium hydrate; the first hydrate crystallized is NaO (HO)$_{3.44}$ and not NaO (HO)$_5$, as has been believed. The second crystalline hydrate, prepared by igneous fusion of the first, is, according to Maumené, NaO (HO)$_{1.49}$. This hydrate, kept for 1½ or 2 hours at a white heat, becomes NaO (HO)$_{0.498}$. In conclusion, the author says : " Hydrates of KO, NaO, BaO and SrO, have no unique formula; they never have the typical composition MO, HO. All the other hydrates follow the same rule. A hydrate L, HO (L being any body whatsoever), only exists accidentally and in very rare cases." (*Bul. Soc. chim.*, 44, 578.) M. L.

Three New Compounds of Rhodium. C. VINCENT.

The sesquichloride, Rh$_2$Cl$_6$ can combine with the hydrochloride

of mono-, di-, and trimethylammonium. The author describes the preparation of pure rhodium and of the chloride by the process of Sainte-Clair Deville and Debray.

The solution of rhodium chloride, concentrated and warm, mixed with the solution of the amine hydrochloride in the same condition, yields the double salt. An excess of the amine salt is necessary, the double salt being more soluble in water.

Monomethylammonium hydrochloride forms long prisms of a deep garnet red, apparently orthorhombic. They contain

Rh --- 21.45
Cl -- 51.57
$NH_2 CH_3$ --- 25.90
                                                         ————
                                                         98.92

Dimethylammonium hydrochloride contanis $3H_2O$. The crystals, which are orthorhombic, have been measured by M. Friedel. The desiccated salt contains

	Found.	Theory.
Rh	22.82%	22.85%
Cl	46.40%	46.81%

The salt of trimethylammonium is very soluble; a slow evaporation gives rise to long prisms of a garnet color. Composition.

	Found.	Theory.
Rh	20.48%	20.90%
Cl	42.35%	42.86%

These three salts are decomposed by heat; the chlorine cannot be determined directly in the salt on account of the formation of a chlororhodiate of silver of a pink color. The salt must be previously fused with sodium carbonate in a platinum dish; sodium chloride is formed; the mass, after fusion, is treated with water and filtered to separate NaCl from rhodium oxide. (*Bul. Soc. chim.*, **44**, *11.*)

M. L.

On Aluminium Oxychlorides.   P. HAUTEFEUILLE and A. PERREY.

The authors did not succeed in producing the direct combination of alumina and aluminium chloride, but obtained the oxychloride by passing a mixture of oxygen and vapors of aluminium chloride

over metallic aluminium heated in a tube. The metal becomes incandescent, and yields a crystalline, very brittle substance. The proportions of Cl and O vary with the temperature of the reaction, oxygen being more abundant when the temperature has been higher. The body is not a mixture of Al_2O_3 and Al_2Cl_6, as the product of reaction is entirely soluble in very dilute acids and alkalies. Similar bodies are produced by passing Cl and O over aluminium. (*Comptes rend.*, 100, *1219*.) M. L.

On Alloys of Cobalt and Copper. G. GUILLEMIN.

Those alloys are obtained by direct fusion under borax and charcoal. They contained from 1 to 6% of cobalt. They can be forged, wire-drawn and rolled like copper, but are more tenacious. Wires break under tension of from 25 to 36 kilos. per sq. mm. (*Comptes rend.*, 101, *433*.) M. L.

Crystallized Zinc Hydrate. J. VILLE.

Prismatic zinc hydrate is easily prepared by treating neutral or basic zinc carbonate with a solution of potash of $\frac{1}{10}$ strength. The quantity of potash must be exactly double the amount necessary to displace the zinc. The easiest way to prepare zinc carbonate is to pass CO_2 into ZnO in the presence of water.

The prisms are more or less modified, and are flattened and truncated according to the concentration of the liquid and quantities of material. (*Comptes rend.*, 101, *375*.) M. L.

Preparation of Arsenic Acid. A. JOLLY.

The directions given by Kopp to use dilute nitric acid (1.35) for the oxidation of arsenious acid are said by the author to be justified by the fact that both arsenical acids can combine in the proportions of 3 to 2, 2 to 1, and 1 to 1, but these combinations are destroyed by water. The combinations are well crystallized, but cannot exist in presence of dilute nitric acid. (*Comptes rend.*, 100, *1219*.) M. L.

On the Oxide of Thorium. L. TROOST.

The author, in order to determine whether the oxide is ThO_2 or ThO, tried to ascertain if it formed, like silica, a compound $XO_2P_2O_5$ (Hautefeuille and Margottet). By treating metaphosphoric acid with anhydrous thorium chloride, he obtained ortho-

rhombic crystals, whereas silicum phosphate crystallizes in octa-
hedra. Those crystals have the formula

$$ThO\ P_2O_5,\ or\ ThO_2\ 2PO_5.$$
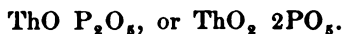
On the other hand the vapor density, taken in Meyer's apparatus
(atmosphere of nitrogen, bath of boiling zinc), was found to be
5.90, 7.01 and 7.49. These numbers are very near of 6.48, which
corresponds to the oxide ThO, or (Th=58.1 ; O=8). *Comptes
rend.*, **101**, *360*.)   M. L.

Some Reactions of CO_2, CS_2 and CO_2. A. EILOART.

A mixture of CO_2 and vapor of CS_2 passed over copper at a
high red heat, yields CO. When copper is omitted there is no
decomposition of CO_2. The action is ascribed to nascent carbon
resulting from decomposition of CS_2 in the formation of Cu_2 S
($CS_2 + CO_2 + 2\ Cu_2 = 2\ CO + 2\ Cu_2$ S); a reaction which may be
regarded as taking place in two stages, one of which involves the
separation of C, the other its oxidation by CO_2. If SO_2 be sub-
stituted for CS_2, CO_2 is formed, amounting, under given condi-
tions, to half of the volume of the issuing gas, less about 5% of CO
resulting from a secondary reaction. CS_2 and SO_2 react below
a red heat, even without the intervention of copper, to form CO_2.
Experiments with carbon carefully purified and heated in a current
of SO_2 showed also an oxidation of C at the expense of SO_2.
(*Chem. News*, 52, *184*.)   A. A. B.

Absorbents for CS_2 Vapor. A. EILBORT.

In order to separate these vapors from mixtures of CO_2 and CO
in gas analysis, the author tried various absorbents by passing a
mixture of air and vapor of CS_2 through them. The substances
tried were caoutchin, roll sulphur (powdered), iodine (followed by
solid paraffin to stop the iodine vapor), potassium triiodide (with
paraffin guard), solution of Br in K Br, and linseed oil. Iodine is
the best absorbent but inconvenient in extended use. Linseed oil
introduced with the mixture of gases into a Crum's tube, was
found to answer every purpose. (*Chem. News*, 52, *184*.)
                                                              A. A. B.

On the Source of the Hydrogen Occluded by Zinc. G. WILLIAMS.

The author has already suggested that the hydrogen in zinc dust

and in meteorites may have a common oxygen, *i. e.*, exposure to a moist atmosphere. Experiment now shows, in respect to zinc dust, that the yield of hydrogen is much increased by wetting and subsequent drying of the dust. A sample of dust so treated yielded, on heating, almost twice the volume of hydrogen contained in the original dust. It is also found that zinc dust absorbs water readily from a moist atmosphere and that the volume of hydrogen obtained from zinc so treated was about seven times that from an equal weight of the original dust. (*Chem. News*, 52, *205.*)   A. A. B.

Oxydation of Iodine in the Process of Nitrification.   A. Muntz.

To explain the presence of iodic acid in the sodium nitrate, the author tried to ascertain whether the organism which produces nitrification could not at the same time oxidize iodine. Potassium iodide put in the centre of a body undergoing nitrification gave rise to iodic acid. (*Comptes rend.*, 100, *1136.*)   M. L.

ORGANIC CHEMISTRY.

Picrylsulphonic Acid and Sodium Picrylsulphonate. C. WILLGERODT.

Fuming nitric acid gives with picryldisulphide only picric acid and sulphuric acid. Sodium picrylsulphonate is easily formed by heating an acoholic picrylchloride solution, with an excess of sodium acid sulphate. It crystallizes with two mol. water in colorless rhombic or rhombohedral crystals. By the addition of an alkali it is decomposed into picrate and sulphite. Picrylsulphonic acid is obtained by adding sulphuric acid to the sodium salt. It crystallizes with two mol. water. Its melting point is 185°. It is easily soluble in water, alcohol and ether, soluble with difficulty in chloroform, insoluble in benzol. (*Jour. prakt. Chem.*, **32**, *117*.)   F. P. V.

Studies on Fatty Bodies. CH. DUBOIS and L. PADÉ.

A contiuation of previous papers, it contains tables showing the solubility of fatty bodies in absolute alcohol, acetone, acetic ether and amylic alcohol; the temperature of solidification, and the solubility of the fatty acids in mixtures of animal fats with butter, and acids. The conclusions are that a knowledge of the solubility of the fatty acids is indispensable in the analysis of a butter, and that this knowledge is often sufficient to decide the presence of a foreign fatty body. (*Bul. Soc. chim.*, **44**, *602*.)   M. L.

On Pathological Urine. A. VILLIERS.

The results of Bouchard and Pouchet, who have announced the discovery of alkaloids in normal urine, are questioned by the author. Examinations of many samples of urine taken from nine subjects in good health, gave negative results in seven cases. In the urine of persons suffering from different diseases, e. g., roseola, diptheria, pneumonia, phthisis and abscess of the head, but to whom no alkaloid had been administered medicinally, alkaloids were found. Bouchard has found them in the urine of typhoid patients. The author has also found alkaloids in his own urine during slight indisposition, but none when in health. He concludes that while normal urine is free from these bodies, slight derangements of the system may lead to their formation. (*Arch. de Pharm.*, **1**, *12*.)
A. A. B.

Composition of Edible Swallow's Nests. J. R. GREEN.

The mucilaginous matter composing this well known Chinese delicacy is, according to Everard Howe, the saliva of the bird itself and is a nitrogenous substance, intermediate between albumin and gelatine. The author has studied this substance anew. It is found to swell up in water, but not to dissolve, either cold or hot, but dissolves readily in lime water or baryta water, yielding a solution which becomes opalescent on addition of acetic acid, but is not precipitated. It gives an abundant red precipitate with alcohol, and shows the xanthoproteic reaction, but is not affected by Millon's reagent. These reactions indicate a glandular product, but it is not known whether the substance is a salivary or a peptogenic secretion. It possesses no power of fermentation, does not transform starch nor act upon fibrine. It resists the action of pepsine, but is attacked by the pancreatic juice. The author believes it to be analogous to the mucine of Eichwald, but finds it difficult to fix its place among the albuminoids. (*Arch. de Pharm.*, 1, *14*.)

A. A. B.

Heat of Combustion of Certain Amines. A. MULLER.

The author tells how the purity of each body was determined. The combustion was effected in Berthelot's calorimeter. The following results were obtained :

	Heat of combustion of one molecule.		Heat of combustion of 1 grm.	Heat of formation of the molecule.
	Gas.	Liquid.	Gas.	Gas.
	Cal.	Cal.	Cal.	Cal.
Monomethylamine	256.9	----	8.276	9.6
Dimethylamine	426	----	9.458	3.5
Trimethylamine	577.6	----	9.783	14.9
Diethylamine	724.4	716.9	9.918	31.1
Triethylamine	1047.1	1038.8	10.363	34.4
Monoisoamylamine	876.4	867.6	10.069	42.1

The number 577.6 found for trimethylamine is quite different from 592, that found by Berthelot. The preparation of the amine is described. With the above figures the heat of substitution of the radicals for the H of NH_3, is calculated, using J. Thomsen's formula. (*Bul. Soc. chim.*, 44, *609*.)

M. L.

On the Chemical Composition of the Porpoise. PURDIE.

A small quantity of milk was obtained from the *mamma* of a porpoise recently caught in the Bay of St. Andrews. The milk was a thick, yellow liquid of fishy smell and of sp. gr. differing little from that of water. An analysis, which was somewhat imperfect, because of the small quantity of material, showed the following composition :

Water,	41.11	Fat,	45.80
Albuminoids,	11.19	Milk Sugar (?)	1.83
Ash,	0.57		

(*Chem. News*, **52**, *170*.)   A. A. B.

ANALYTICAL CHEMISTRY.

Behavior of Nitrates in Kjeldahl's Process. R. WAR-RINGTON.

The application of this well known process for determination of nitrogen in organic bodies fails in respect to nitrogen of nitrates. Kjeldahl has shown that a portion of this nitric nitrogen is converted into ammonia in his process, under the influence of organic matter. The removal of nitrates by heating with oil of vitriol and ammonium sulphate, a method used in other cases, is inapplicable here for the above reason, although the author shows that the loss of ammonia (probably occurring through formation and subsequent decomposition of ammonium nitrate), can be practically prevented by addition of a small quantity of water. Apparently the most available method is one in which the nitrates are decomposed before adding concentrated sulphuric acid to the organic substance. Such a method the author finds in treatment of the organic substance. containing nitrates, with an excess of ferrous sulphate and strong HCl. Nitric nitrogen being thus removed, the mass is dried and the process of Kjeldahl is applied as usual. The results are fair. Further experiments are promised. (*Chem. News*, **52**, *162*.)

A. A. B.

Note on Warrington's Modification of Kjeldahl's Process. H. B. YARDLEY.

The loss of N on addition of water to the mixture of conc. H_2SO_4 and organic matter, regarded by Warrington as due to action of nitrous acids on ammonia or amides, may be so explained when nitrates were originally present, but in their absence there is still a loss of nitrogen, which the author ascribes to decomposition of nitrogenous matter by SO_2 resulting from the reaction of H_2SO_4 on organic matter.

Mixtures of wool dust and chamber acid (H_2SO_4 90° Tw.) were heated to disintegration of the dust, after passage of CO_2 to remove air, and CO_2 was again passed to remove gases set free by the action of H_2SO_4. After absorption of CO_2 by potash, a residue of nitrogen was found. In a similar experiment in which the mixture was distilled, the distillate had the odor and taste of SO_2, and on neutralization and evaporation yielded N by combustion with soda-lime. (*Chem. News*, 52, *220.*)　　　A. A. B.

A Modification of Kjeldahl's Method. H. HILFAHRT.

The author adds a metallic oxide or salt to the sulphuric acid serving for the destruction of organic matter, with the effect of hastening the process. Cupric sulphate is preferred. The effect is said to be a saving of seven-eighths of the time otherwise necessary. (*Chem. News*, 52, *221, from Mon. Sci.*)　　　A. A. B.

Digestion Furnace for Kjeldahl Nitrogen Determinations. N. KREUSLER.

This gas furnace is constructed with burners, in pairs, opposite one another, with simple chimney and screw-valves. The digestion is carried on in glass flasks reclining on wire gauze over the burners. (*Zeit. anal. Chem.*, 24, *393.*)　　　F. P. V.

Uranium Acetate as a Reagent for Albuminoids. N KOWALEWOKY.

Under certain conditions, uranium acetate gives a precipitate with albuminous bodies. This precipitate is somewhat soluble in water. It retains the characteristics of albumen, but uranium is only detected after acidifying. For washing the precipitate it is

well to use alcohol. The precipitate is soluble in acids. In alkalies it is soluble with decomposition. A precipitate is gotten when only .019% albumen is present. In albuminous urine the test may be carried out by redissolving the precipitate of phosphate and albuminoid, and then adding concentrated nitric acid which causes the reseparation of the albumen. (*Zeit. anal. Chem.*, 24, *551.*)

F. P. V.

Critical and Experimental Review of the Knop-Hufner Method for the Determination of Urea. CARL JACOBJ.

The modifications of the method are noted, but the original directions of Knop are followed in the experiments, making use of the empirical correction advised by Hüfner. The method is tested with solutions of pure urea, normal and pathological urine, and urine to which glucose or aceto-acetic ether have been intentionally added. Comparative determinations are also made with the Liebig-Pflüger method. Certain adverse criticisms on the Knop-Hüfner method are discussed, and the author concludes that it is better suited for accurate scientific researches than the Liebig-Pflüger method. (*Zeit. anal. Chem.*, 24, *307.*)   F. P. V.

On the Detection and Determination of the Bases of the Pyridine and Quinoline Series. O. DE CONINCK.

The author has studied quinoline resulting from the decompositions of brucine by caustic potash. The fraction passing from 150° to 170°, contains chiefly β-lutidine, and a small quantity of an isomeric lutidine.

He submitted the chloroplatinates to Anderson's reaction (boiling water). The β-lutidine is entirely transformed, while the other base is nearly all transformed into the double salt.

$$[(C_7H_9NCl)_2, PtCl_2 + C_7H_9(NCl)_2 PtCl_4.]$$

	Found.	Theory.
Pt	33.20%	33.41%
Cl	29.80%	30.11%

This salt, treated again with boiling water, gave the modified salt.

$$(C_7H_9NCl)_2 + PtCl_2.$$
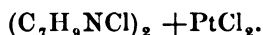
These reactions establish, beyond a doubt, the existence of another pyridine base besides β-lutidine.

Determinations of this base, by the means of the platinochloride and of the aurochloride, were made.

As for the double salts of the pyridine dihydrides, the modification of the platinochloride (PtCl₂ compound), must be made with tepid water. The gold salts cannot be handled on account of their tendency to decompose. The author uses this ready reduction of the gold double salts to characterize the quinoline and pyridine hydrides in the presence of the pyridine and quinoline bases. (*Bul. Soc. chim.*, 44, *617.*)   M. L.

Rapid Determination of Nitric Acid. A. GRANDVAL and H. LAJOUS.

This process depends upon the transformation of phenol into picric acid by the nitric acid present, and the comparison of the color of the ammonium picrate formed with a standard solution of this last salt.

The nitric solution is neutralized and evaporated to dryness, the residue is treated with sulphophenic acid (30 gms. pure phenol, 37 gms. pure SO₃). Water and excess of ammonia are then added. The operation is repeated with a standard solution of potassium nitrate ; then the solutions are compared by means of Duboscq's colorimeter.· This process is rapid and delicate ; nitric acid determinations in air can be made in quick succession by passing a known volume of air through a solution of sodium carbonate, passing 50 liters for each determination. (*Comptes rend.*, 101, *62.*)
                                                                                         M. L.

The Combustion of Carbohydrates by Means of Chromic Acid. C. F. CROSS and E. J. BEVAN.

In the course of their researches upon cellulose, the authors have tried processes involving the above principle. An apparatus like that of Fresenius & Will for estimation of CO₂ was first tried but later a modification of the Schiebler apparatus was found more suitable. The substance, mixed with or dissolved in strong H₂SO₄, is contained in a small flask in which is placed also a short tube containing chromic acid, which can be mixed with the substance as desired, by including the flask. The conversion of C into CO₂ is not complete, but inasmuch as the two oxides of carbon CO and CO₂ have the same volume, the volume of gas evolved is a representa-

tive of the carbon contained in the substance. Combustions of Swedish filter paper by this method yielded C 43.65%—43.80%. Theory for cellulose 44.4%. The applicability of this method to other organic substances is to be further tested. (*Chem. News*, 52, *207.*) A. A. B.

Detection and Determination of the Sulpho- Compounds of Fuchsine in Wines. P. CAZENEUVE.

The author describes the process of Ch. Girard (potash and mercuric acetate), and the process of M. Bellier (magnesia and mercuric acetate). In the last the wine (10 c.c.) is mixed with the powder and boiled. The solution is filtered, and passes colorless. The addition of an acid gives a red coloration in case of the presence of a sulpho- compound of fuchsine.

50 c.c. of the wine are shaken with 50 grams of manganic oxide for 5 minutes. Only the wines colored with the sulpho-compounds of fuchsine remain red; all the others are discolored, even those containing fuchsine, and especially the azo- compounds. (*Bul. Soc chim.*, 44, *611.*) M. L.

A Modification of the Molybdate Method of Estimating Phosphorus in Steel. E. F. WOOD.

The exact determination of phosphorus in steel by precipitation from the nitric acid solution, without evaporation to dryness is impossible. The author finds the loss of phosphorus to be about one-third. He avoids the error by dissolving steel in nitric acid containing chromic acid.

The yellow precipitate obtained by molybdate is dried at 100°, and weighed directly. If 1.63 grm. of steel be taken for analysis, each mg. of precipitate corresponds to .001% P. Full details of the process are given. The process is said to be rapid and accurate. It is not applicable to cast iron. (*Chem. News*, 52, *279.*) A. A. B.

Analysis of Staurotide. M. COLORIANO.

This mineral is a silicate of iron and alumina; the author analyzed staurotide from the St. Gothard, and removed the foreign minerals by digestion in diluted hydrofluoric acid. The sample was finely pulverized, and treated under pressure at 210° with 9 c.c. of H_2SO_4 and 6 c.c. water for 1 grm. of mineral. The ferrous oxide is determined with permanganate. In one analysis he found :

FeO _____ _____ 9.13
Fe_2O_3 _____ _____ 6.83
Al_2O_3_____54.20
SiO_2 _____27.38
Water_____ 1.43
                                                                    —————
                                                                    98.97

The author proposes for staurotide the formula,

$$5SiO_2, 6Al_2O_3, 2FeO, H_2O,$$
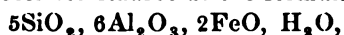
and he supposes that at the time of its formation staurotide was a silicate of alumina and of ferrous oxide, which was afterwards partly oxydized in the air. (*Bul. Soc. chim.*, **43**, *427.*)   M. L.

The Detection and Determination of Fluorine. G. TAMMANN.

This is a discussion of the methods in use, with experiments as to their usefulness. The author recommends in the case of soluble fluorine compounds the decomposition with silicic and hydrochloric acids, with the addition of potassium acetate and alcohol, filtering, washing with alcohol and titrating with potassium hydroxide (or gravimetrically substituting hydriodic acid for hydrochloric), then adding barium acetate and alcohol, filtering, treating the filtrate with alcohol containing hydrofluoric acid, and then weighing the barium silicofluoride, or converting it into barium sulphate. For difficultly soluble fluorides, first decompose with sulphuric acid in the apparatus in general use, determining the fluorine in the water of the absorption apparatus as above. The loss of fluorine during the incineration of organic substances is not prevented by an excess of barium hydroxide and sodium carbonate. (*Zeit. anal. Chem.*, **24**, *328.*)

Determination of Potassium Acid Tartrate in Argol, etc. F. KLEIN.

The method adopted by the author depends upon the insolubility of the acid tartrate in a solution of potassium chloride. The systems of analysis in general use are also discussed. (*Zeit. anal. Chem.*, **24**, *379.*)   F. P. V.

Moisture Retained by Gases Dried by Means of Sulphuric Acid. E. W. MORLEY.

The author finds that the five-hundredth part of a millogram is retained per liter of air. This corresponds with the amount noticed

by Dibbits as removable by phosphorus pentoxide from air dried
by sulphuric acid. Experiments showed that one liter of air in
passing through sulphuric acid (1.84 Sp. Gr.), took up one two-
thousandth to one three-thousandth millogram of sulphur trioxide.
For full description of the apparatus and method used, reference
must be made to the original article. (*Zeit. anal. Chem.*, 24, *533.*)

F. P. V.

A New Method for Determining Alumina. K. J. BAYER.

The method depends upon a precipitation and re-solution of the
alumina with normal sodium hydroxide solution, adding then
litmus and titrating with normal sulphuric acid to reddening.
Another portion is precipitated and dissolved in the same way.
Tropaeolin is added and the titration, with normal sulphuric acid,
is carried out to the orange color of tropaeolin. The difference be-
tween the amounts of sulphuric acid used corresponds to the alumina
present. (*Zeit. anal. Chem.*, 24, *542.*) F. P. V.

Use of Sodium Bromate in Volumetric Analysis. KRATSCHMER.

This salt, which is easily gotten by the addition of bromine in
excess to hot sodium hydroxide solution, and may be purified by
recrystallization, is shown by the author's experiments to be a con-
venient and satisfactory means for the titration of iodine solutions
in volumetric analysis. It sets free from such solutions, when
acidified with mineral acids, the exact amount of iodine correspond-
ing to the oxygen it contains. (*Zeit. anal. Chem.*, 24, *546.*)

F. P. V.

Separation of Zinc and Cadmium by Electrolysis. S. ELIASBERG.

The author having examined the conditions favorable to the suc-
cess of Iver's electrolytic process for the separation of these metals,
finds the most favorable conditions to exist when the metals are
brought into the form of double oxalates, by adding potassium and
ammonium oxalates. The amount of liquid should not exceed
90 c. c. ; and the liquid must be kept warm while a current of
.01–.015 ampère is passed through for 6–7 hours. This is the time
necessary for .15 grams of the metal. The cadmium separates uni-
formly and smoothly, and sometimes crystalline. (*Zeit. anal.
Chem.*, 24, *548.*) F. P. V.

Abstracts of American Patents Relating to Chemistry.

(From the Official Gazette of the U. S. Patent Office.)

November 17th, 1885.

330,381.—Process of drying air for metallurgical operations. J. H. Cremer.

330,415.—Open hearth furnace°for iron and steel. O. Murisier and P. C. Gilchrist.
The furnace is lined with calcined lime mixed with tar.

330,454.—Process of precipitating nickel and cobalt from solutions containing the same. C. H. Aaron.
The metals are precipitated as methylsulphocarbonates.

330,602.—Manufacture of cement. H. Mathey.
Cement rock is ground to fine powder and then calcined.

330,602.—Manufacture of lime. H. Mathey.
Limestone is crushed or pulverized and burnt in a revolving cylinder.

330,613.—Manufacture of rosin compounds. D. J. Ogilvy.
To form a vehicle for paints, printing inks, etc., rosin is saponified with an alkali, and then dissolved, preferably in a mineral oil.

330,637.—Process of purifying petroleum. J. H. Tiemann.
Powdered silicious or other inorganic substance is agitated with the mixture of acid and oil.

330,781.—Process of manufacturing coke. H. M. Pierce.

330,782.—Furnace for the manufacture of coke. H. M. Pierce.

330,747.—Process of producing illuminating gas. R. H. Smith.
Natural gas is heated to a sufficient temperature to decompose and convert a fluid hydrocarbon into a fixed gas, and such hydrocarbon is then brought in contact with the heated natural gas.

330,778.—Apparatus for making gas. W. P. Elliott.
Brief.—Coal is distilled in closed retorts and the resulting gas is passed separately to the main. Water-gas is generated in the fuel chamber or furnace below the retort chamber, is carbureted with oil vapor in the retort chamber and the mixed gas and vapor is converted into a fixed gas in the fixing chamber. The retorts are heated by products of combustion from the fuel and by the hot water-gas circulated around them.

330,815.—Manufacture of lactates. C. E. Avery.

November 24th, 1885.

330,884.—Apparatus for freezing liquids. E. Fixary.

330,894.—Safety paper for checks, drafts, etc. F. M. Hill.
Manganese ferrocyanide and hydrated ferric oxide are added to the paper pulp or sizing.

331,059.—Manufacture of β-naphthol-sulphonic acid. M. Hoffmann.

β-naphthol-γ-sulpho- acid is produced by first sulphonating β-naphthol α-monosulpho- acid or β-naphthol, and purifying the acid.

331,104.—Process of covering metallic objects with an electroplating of magnetic oxide. W. H. Winslow.

Brief.—Electroplates with iron, and then converts iron into magnetic oxide, by means of superheated steam.

331,105.—Magnetic-oxide-of-iron-plated ware. W. H. Winslow.

331,190.—Disinfecting and cleansing liquid for animals, etc. H. Endemann.

Consists of heavy oil of coal tar, spirits of wood tar, potash soap, and potash solution.

331,225.—Process of treating heating and illuminating gases. W. F. Browne.

331,248.—Manufacture of cement. W. Joy.

331,249.—Process of making zinc sulphide pigment. T. McFarlane.

December 1st, 1885.

331,312.—Composition for fireproofing and other preservative purposes. A. J. Martin.

A composition of glycerine, ammonium carbonate, ammonium chloride, potassium tartrate, potassium oxalate, and boric acid.

331,328.—Manufacture of pulp from woody matter. R. P. Pictet and G. L. Brélaz.

Wood is subjected to the action of a saturated solution of sulphurous acid, at a temperature not exceeding 100° C.

331,383.—Mixed paint. H. C. Dorr.

A ship paint consisting of oil of tar, gum shellac, calomel, and gypsum.

331,457.—Mode of and apparatus for making ice, refrigerating, etc. A. G. Southby.

331,541.—Baking powder. A. Peters.

Consists of calcium, magnesium, or strontium carbonate, and an acid sodium sulphate, or other equivalent acid sulphate of an alkali.

331,542.—Baking powder. A. Peters.

Consists of an acid calcium phosphate, and calcium, magnesium or strontium carbonate.

331,621.—Apparatus for making illuminating gas. F. Egner.

331,632.—Polishing composition. H. L. Haas.

A compound of tar and fatty substances and polishing materials.

331,702.—Method of treating cotton seed and analogous oils. J. B. Grant and A. Mason.

The oil is partially distilled in the presence of carbon dioxide, and then saturated with the gas.

December 8th, 1885.

331,775.—Food compound. A. A. De Puy.

Consists of sugar, potassium nitrate, glycerine, sodium bicarbonate, sodium protoxide, sodium chloride, water, and milk. ·

331,777.—Dyeing aniline black. A. N. Dubois.

The fabric is first soaked in a bath of soluble castor oil, then for about three hours in a bath consisting of water, aniline oil, hydrochloric acid, ferric nitrate, and potassium bichromate, after which it is finished in a bath of soap.

331,810.—Cleaning fluid. C. T. Mutchler.

Consists of alcohol, sulphuric ether, salts of tartar, potassium cyanide, and ammonium hydrate.

331,860.—Apparatus for extracting mercury from its ores. H. Berrens.

331,903.—Process of manufacturing illuminating gas. J. W. Mitchell.

The process consists in, first, bringing a body of fuel to incandescence; second, passing air and superheated steam simultaneously through the fuel; third, injecting superheated steam and crude petroleum into a chamber with which the water-gas generating chamber is connected; and, fourth, purifying the gas.

331,942.—Tanning hides and skins. T. R. Clark.

The hides are repeatedly treated with a compound of potassium carbonate, water, and animal oil.

331,964.—Manufacture of benzylated methyl violet. H. Hassencamp.

331,965.—Manufacture of benzylated acid violet. H. Hassencamp.

Methyl violet is reduced to its leuco-base, which is benzylated, and converted into its leucosulpho- acid, from which the sulpho- acid of the dye stuff is obtained by oxidation.

332,087.—Apparatus for manufacturing non-luminous heating gas. J. Kidd.

December 15th, 1885.

332,820.—Apparatus for distilling wood. T. H. Berry.

332,858.—Producing chloriodine double combinations from pyridine and chinoline bases. E. Ostermayer and M. Dittmar.

Pyridine, chinoline, tetrahydrochinoline or chinoline methylate are treated with chloriodhydrochloric acid.

332,864.—Process of producing photographs in permanent pigments. W. W. Sherman.

332,441.—Process of making crystalline glass. E. A. Savary.

The glass is coated with a solution of Epsom salt, which is allowed to dry, and the coated surface is treated with hydrofluoric acid.

332,458.—Process of manufacturing fluxes. H. F. Taylor and G. Leyshon.

332,497.—Artificial fuel and process of making the same. W. H. Cory.

Carbonaceous matter and potassium or sodium silicate are mixed together, and the mixture is subjected to the action of an acid to set free the alkali. The resulting mass is compressed into cakes.

882,498.—Carbonaceous fuel and process of making the same. W. H. Cory. Consists of carbonaceous dust, potassium silicate, and alumina.

882,528.—Dye stuff made from diazonaphthaline. M. Hoffmann.

882,569.—Apparatus for manufacturing illuminating gas. J. L. Stewart.

Brief.—Heating and illuminating gases are made in the same apparatus by combustion of fuel in the decomposing chamber and of the resulting gaseous products in a steam superheating chamber, then superheating steam by passage down through such superheater, decomposing it by passage down through the incandescent fuel and conducting the resulting gases off at the base of the fuel chamber.   When the apparatus is reduced to the proper temperature, oil spray is injected into the top of the superheating chamber by means of a jet of waterrgas under pressure, and the resulting oil vapor is converted into hydrocarbon gas by passage through such chamber.

December 22d, 1885.

882,705.—Apparatus for chloridizing gold, silver and other ores. H. H. Eames.

882,736.—Metallic alloy or compound in producing the same. H. J. F. Niewerth.

The process of alloying heavy metals with metallic sulphides, which con sists in first dissolving the sulphide of the metal in molten zinc, then mixing the product with the heavy metals, and finally removing the zinc by cuppel lation.

882,751.—Production of cold. A. J. Rossi.

Uses carbon dioxide with sulphuric ether.

882,751.—Production of cold. A. J. Rossi.

Uses a ternary liquid consisting of carbon dioxide combined with a binary volatile absorbent.

882,756.—Stove polish. W. T. See.

Consists of water, dextrin, plumbago and lamp black.

882,829.—Manufacture of β-naphthylaminesulpho- acid. H. Prinz.

The β-naphtholsulpho-acid described by Schaefer is treated with ammonia at a temperature of about 180°–200° C.

882,830.—Red coloring matter from β-naphthylaminesulpho- acid. H. Prinz. Obtained by combining β-naphtholdisulpho- acid with the diazo-compounds of β-naphthylaminesulpho- acid.

882,868.—Composition of matter for waterproofing paper. C. S. Bird. Consists of resin, paraffin and sodium silicate.

882,957.—Process of manufacturing illuminating gas. B. Sloper.

Gas is generated by simultaneously acting upon metal scrap and marble dust with dilute acid. The resulting gas is enriched with hydrocarbon vapor.

883,034.—Manufacture of color producing acids. H. Vollbrecht and C. Mensching.

A new naphtholdisulpho- acid, derived from naphthylaminesulpho- acid.

838,035.—Coloring matter derived from α-naphtholdisulphonic acid. H. Vollbrecht and C. Mensching.

The diazoxylol compound of α-naphtholdisulpho- acid.

838,036.—Nitronaphtholsulphonic acid. H. Vollbrecht and C. Mensching.

838,037.—Manufacture of dyestuff from naphthol. H. Vollbrecht and C. Mensching.

Produced by the reaction of diazoazobenzol with the solution of the sodium salt of naphtholdisulpho- acid.

880,038.—Manufacture of dyestuff from naphthol. H. Vollbrecht and C. Menschinger.

Produced by the reaction of diazotoluol with the solution of the sodium salt of naphtholdisulpho- acid.

838,039.—Coloring matter derived from diazobenzol and α-naphthol-disulphonic acid. H. Vollbrecht and C. Mensching.

838,040.—α-naphtholsulphonic acid. H. Vollbrecht and C. Mensching.

838,041.—Coloring matter derived from diazobenzol and α-naphthol. H. Vollbrecht and C. Mensching.

Produced by the reaction of diazobenzol with the sodium salt of naphthol-monosulpho- acid.

838,042.—Coloring matter derived from α-naphthol and diazotolnol. H. Vollbrecht and C. Mensching.

Produced by the reaction of diazotolnolsulpho- acid with the sodium salt of naphtholmonosulpho- acid.

W. R.

ERRATA.

p. 44, table at bottom should read as follows:

Percentage of water, as determined 3.00
" glucose, guessed at .... .30
" ashes, multiplied by 6¼ (2.50 × 6.8)..........17.00
                                                    ———
                                                    20.30

p. 61, 13th line from bottom, for "nitrate" read "nitrite."

p. 106, 13th and 16th lines from bottom, for " V " read " U."

p. 136, middle of page, for "3.75%" read "13.75%."

p. 137, bottom of page, for "86%" read "96%."

p. 194, top, for "Kellar" read "Keller."

p. 206, 13th line from bottom, for "Thekulé" read "Kekulé."

p. 246, middle of page, after "Bromamidophenols" read "F. Schütt."

INDEX OF TITLES.

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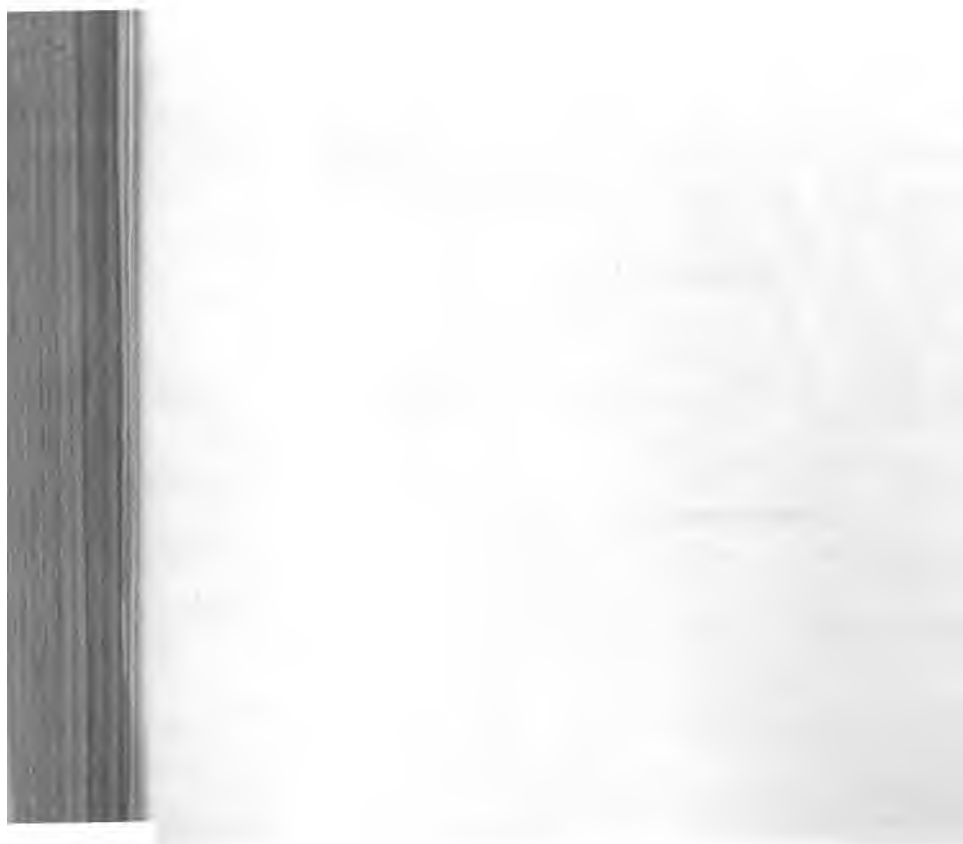
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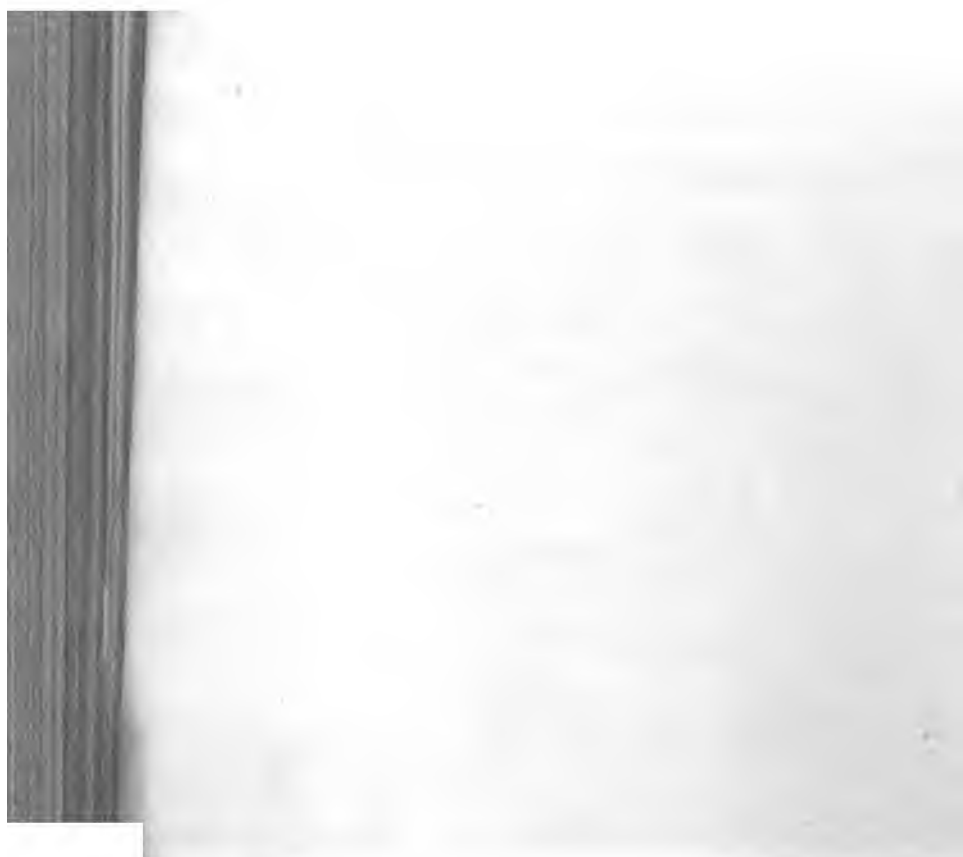Youmans, W. J..........Care D. Appleton & Co., 1 Bond St., N. Y.

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Elmerhorst, W. R.........St. Lawrence Sugar Refining Co., Montreal,
                              Canada.

Harding, G.............237 Broadway, N. Y.
Havemeyer, C. W...... .112 Wall St., N. Y.
Havemeyer, H. O.........117 Wall St., N. Y.
†Havemeyer, T. O........117 Wall St., N. Y.
Heinitsh, C. A...........16 East King St., Lancaster, Pa.
Heller, Fred.............55 Maiden Lane, N. Y.
Holly, J. J.............63 Beaver St., N. Y.

†Kuttroff, Adolph.........98 Liberty St., N. Y.

Lennig, Charles...........112 S. Front St., Philadelphia, Pa.

Mapes, C. V.............158 Front St., N. Y.
Matthiessen, F. O.........106 Wall St., N. Y.
Meyer, H. C.............140 William St., N. Y.
Merz, Henry.............55 Maiden Lane, N. Y.

Nichols, G. H...........41 Cedar St., N. Y.

......................St., N. Y.
Wilhelm.... St., N. Y.

Plympton, G. M.............245 Broadway, N. Y.
Polledo, G.................40 Stuyvesant St., N. Y.
†Prentice, W. P............801 Mott St., N. Y.

Renwick, E. S.............16 Murray St., N. Y.
Rudesch, J................117 East 59th St., N. Y.

†Senff, C. H..............117 Wall St., N. Y.
Sieghortner, A. L.........Care Belcher Sugar Ref. Co., St. Louis, Mo.
Stursberg, J. A...........Brooklyn Sugar Refinery, foot S. 2d. St., Brooklyn,
                              N. Y.

Weston, E. D..............118 Wabash Ave., Chicago, Ill.
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